The Chemical Age

VOL LXI 10 DECEMBER 1949 No 1587

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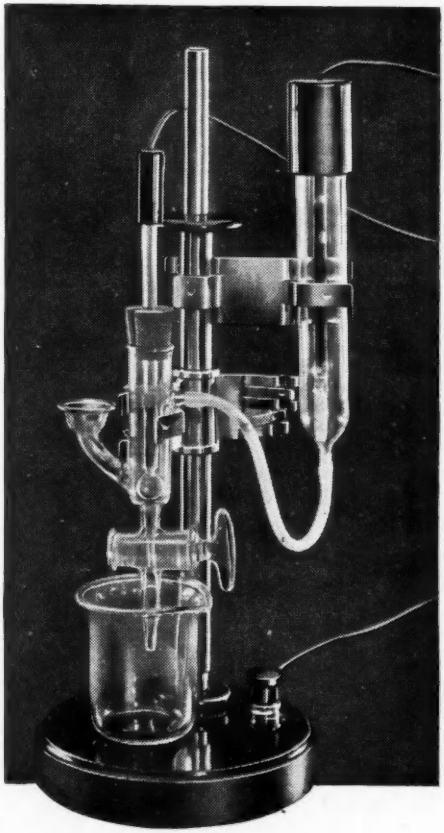

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South African Source of Uranium

INCREASING familiarity with some industrial and scientific possibilities of uranium minerals in the hands of atomic physicists, collaborating with chemists and, in particular, with chemical engineers, has imbued the subject of uranium sources with an urgency which was lacking when fissionable material seemed to belong exclusively to the sphere of abstruse research or power politics. While much of the subject matter of nuclear physics remains as remote as ever, there has lately been sufficient evidence of practical possibilities of industrial applications to lend immediate interest to the subject of source materials. The most recent illustration has been the mission by representatives of the U.S. Atomic Energy Commission and their counterparts in this country to investigate and discuss with the South African Atomic Energy Board, in Johannesburg, the possibility of recovering uranium ore as a by-product of goldmining. In the prevailing ignorance, outside some uncommunicative official circles, about the prospects of securing a supply of naturally occurring radioactive material to support the developments that have been foreshadowed the authenticated facts about the ore known to occur in vast quantities in the Rand are worthy of attention. South Africa's goldmining areas may be the world's largest single source of low-grade uranium ore.

The presence in certain Rand concentrates of a mineral known as uraninite, nearly one-half of which consists of a compound of uranium, was announced by Mr. R. A. Cooper in a paper delivered to the Chemical, Metallurgical and Mining Society of South Africa as long ago as 1923. Mr. Cooper suggested that it would be interesting to purify the uraninite by mechanical means and ascertain the true constituents of the pure mineral and its radioactive value. Until the advent of atomic power, uraninite remained a mineral of purely scientific interest. In 1945, however, the exploitation of uranium in the Union was brought under control by proclamation and subsequently a Bill providing for permanent control regulations was introduced by General Smuts himself. In the speech from the throne at the opening of Parliament, reference was made to the discovery of considerable uranium resources in the Union. The extent and richness or otherwise of the South African deposits were not revealed, but despite official reticence

On Other Pages

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it was generally accepted that the Government was directing its attention to the possible exploitation of the radioactive materials in the Rand rock formations. Last year it was reported that uranium had been found in almost every mine on the Rand and even in the Orange Free State boreholes. Apart from the vast tonnages of uranium ore presumed to exist in the unmined ore reserves, the mine dumps or sands residues are believed to contain large quantities which might conceivably be recovered.

Secrecy is being preserved as to the percentages of uranium contained in the ores, but they certainly are not large. The extraction of minute quantities presents formidable technical problems, but very highly organised research facilities are available at the university and Government laboratories of Johannesburg and Pretoria. Once the initial problems have been overcome extraction can be undertaken by an established mining industry with the most advanced technical resources of any. Preliminary investigations are being conducted by a research committee whose chairman, Dr. B. F. Schonland, has a record of outstanding achievement in the application of engineering and scientific developments to military and mining problems.

The economic aspects of low-grade uranium ores cannot be entirely divorced from the circumstance that the Ministry of Supply's prices refer, as a rule, only to ores with a U_3O_8 content of not less than 10 per cent. For these is offered 13s. 8d. per lb. of the oxide. It seems evident, therefore, that the exploitation of extremely low-grade ores could not be an economic proposition on its own. As a by-product of goldmining, however, it is possible that the price for the product of uraninite might represent a useful addition to working profits.

A distinguished South African scientist, not long ago, expressed the opinion that it might be a hundred years before the Rand's deposits could be exploited. There is little room to doubt the accuracy of this estimate at that time. It is certain, however, that because of strategic considerations the exploitation of the Rand's enormous low-grade resources will not be governed primarily by economic considerations. The prospect is that the Rand's uranium will be recovered just as soon as technical resources permit.

Notes and Comments

West German Plant

THE uncertainty caused by the recent statement by Sir Brian Robertson that certain of the west German plants previously scheduled for dismantling had been reprieved—notably three Bergius (high pressure) and six Fischer-Tropsch plants (THE CHEMICAL AGE, *61*, 377 and 763)—has not been dissipated by a reply given in the House of Commons last week by Mr. C. P. Mayhew, Under-Secretary of State for Foreign Affairs, to a question from Mr. T. C. Skeffington-Lodge. The latter wanted to know what would be the permitted uses of the nine synthetic oil and rubber plants now excluded from the dismantling list; and whether it was intended to maintain the illegality of German manufacture of oil and rubber. Mr. Mayhew's reply (reports *Hansard*) was: "The answer to the second part of the question is, 'Yes, Sir.' The answer to the first part is that, subject to the maintenance of the prohibitions laid down in the Washington Agreement of April 1949, the future use of these plants is now a matter for German decision." Where is all this leading? The parliamentary reply apparently means that the Germans can have the reprieved plant items, but that they may not use them for the manufacture of oil and rubber. The answer to both questions may be implicit in the reported views of the German interests concerned—of which an indication is given by a special correspondent elsewhere in this issue. They, at least, plan quickly to start production in some of these plants, and seem confident that permission will not be withheld. Time will show how permanent is the ban on oil and rubber.

Contrast in Charges

COMPARISONS between State-controlled enterprises and private industries are so seldom flattering to the Government undertaking that Parliamentary spokesmen are generally careful not to invite them. Mr. Barnes must have forgotten that sensible reticence last week when, in defence of the nationalised railways' decision to raise freight rates by 16⅔ per cent to offset mountainous losses, he asked what other industry could bear a weighted average increase of 120 per cent in expenses and materials costs and raise its charges only 55 per cent. The answer to that question, assumed to be unanswerable, has quickly been supplied by Lord Selborne, in his capacity as chairman of the Cement Makers' Federation. Coal, costing 145 per cent more than it did before the war, taxes the cement industry rather more rigorously than it does the railways, says the chairman in a letter to the *Times*. It requires 8 cwt. of coal to make a ton of cement. Yet cement today costs only 53 per cent more than it did before the war and, far from losing £20 million on the year's working, the cement industry has made a profit. Were it to follow the railways' example, cement, in London, would cost another 11s. 8d. per ton. "Is that what the public may expect if cement is nationalised?" asks Lord Selborne.

Steel Facts

THE same theme—the illusory nature of the vaunted benefits of nationalisation—has received trenchant handling from the chairman of Glasgow Chamber of Commerce, calling attention, last week, to the performance by the steel industry, which tends to make the recent elaborate strategems to ensure its nationalisation more than ever irrational. Mr. Harry Yates invited attention to some of those evidences of mounting steel production which, because they recur almost month by month, are in danger of passing unnoticed. He recalled, for example, that October's steel total, at the rate of 15,959,000 tons a year, compared with a rate of 15,445,000 tons in the previous October, helped to

ensure that the production target for this year would be surpassed. He stressed, too, an achievement by which the steel industry has set a goal which not many U.K. industries have yet managed to attain—by keeping steel prices below those of the U.S.A. and European countries in most markets. But for Government-planned allocations, claims Mr. Yates, there would have been larger steel exports and fewer problems in home supplies. Those who have just secured the qualified acceptance of the Iron and Steel Bill will hotly deny the truth of that, in proof of which no conclusive evidence, for or against, can be produced. Much less easily disposed of, however, is the Glasgow chairman's invitation to consider what have been the sequel to nationalisation elsewhere: scarcer, dearer and poorer coal; dearer and less efficient transport; dearer electricity.

Conservation in India

DEPLETION of metals from the accessible portions of the earth's crust is a matter of growing concern as the realisation spreads that the world is using up its non-replenishable reserves at a continually increasing pace. India is one of the countries which has recently come to recognise the alarming implications and the danger of the popular misapprehension that she possesses untold mineral wealth. The need to make the most of these reserves is being actively propagated and is reinforced by the argument that they can play an important rôle in enriching the life of the new nation. Supplies of certain metals and ores in India are quite adequate to support higher living standards, as D. N. Wadia testified at the Conservation Conference at Lake Succes. The new determination to exploit India's minerals, without delay or the waste which speculative activity can produce, is reflected by the acceptance of the Mines and Minerals (Regulation and Development) Act, 1948, by which a central authority should be able to enforce the systematic mining of ore bodies, and the strengthening of the Geological Survey of India by the recruitment of some 120 officers above the present 130. The trend of policy at the moment errs perhaps in its attempt to conserve for use within India of more minerals than the home industries may be able to use economically in their present stage of development. Instances are the export ban on beryl, monazite and other minerals associated with atomic energy projects and the stringent restriction of exports of manganese, kyanite and chromite. India's own economy may, however, be relied on to enforce more enlightened views before long.

Robert Hooke

THAT there is in fact "a destiny that shapes our ends" finds testimony in the strange career of Robert Hooke whose intellectual adventures brought into existence new schools of thought in several of the sciences. Robert Hooke, about whom Professor E. N. da C. Andrade will deliver the Wilkins lecture at the Royal Society, was a genius whose feeble constitution robbed him of the rewards which his vigorous questing intellect could have won. The exercise of the extraordinary inventiveness, which he displayed from his youth, was cheated of full development by a desultoriness which persisted all his life. Apart from his remarkable scientific insight, Hooke, who was appointed curator of the Royal Society in 1662, was also an accomplished architect. In 1667 he exhibited a model for rebuilding the City after the Great Fire which, although not adopted, procured him the post of City Surveyor. He was one of the great microscopists and also carried out noteworthy experiments on respiration and combustion. He was the first to recognise the true nature of fossils and their importance as a record of the earth's history. The nature of air, heat, and light, specific weights, laws of falling bodies, cosmology . . . nothing seemed to escape the keen eye of this consummate observer. Samuel Pepys (1666) records that he thought "his discourse, in general, fine," but his pretension to tell how many strokes a fly makes with her wings, "a little too much refined."

HARWELL'S CYCLOTRON

Good Results with Hydrogen Nuclei

THE first full trial of the recently completed frequency modulated cyclotron at Harwell, the construction and housing of which have occupied three years, was carried out successfully this week. Experience in the U.S.A. with similar very large installations supports the view that the new cyclotron will promote valuable developments in nuclear research. It enables the nuclei of most atoms to be broken up, and can also make available nuclei of new types.

The acceleration of movement of the atomic nuclei—up to 95,000 miles a second—is achieved by an accelerating voltage of a short wave radio oscillator applied in successive steps. At the moment the machine is producing a total accelerating voltage of about 160 million volts, which will finally be increased to 180 million volts or more. The atomic nuclei of hydrogen are now being used for these experiments.

Engineering Achievement

The magnet of the cyclotron, which is the largest in Europe, contains 700 tons of steel; its oil-cooled energising winding contains 80 tons of copper and consumes over 300 kW of electrical power. The oscillator can give a maximum power of 150 kW. Large vacuum pumps maintain a high vacuum in the accelerating system, which has a volume of about 500 cu. ft. The main parts of the cyclotron are cooled by circulating specially treated water.

Those operating the machine are protected by a remote control system incorporating safety circuits.

FIRST FRENCH PLUTONIUM

French scientists were celebrating last week a new stage in nuclear physics, represented by the production in l'Usine Atomique du Bouchet of the first 1 mg. of plutonium, in the form of a pure salt. This is taken to vindicate the usefulness of the work at the first atomic pile ("Zoe") at Chatillon by M. Bertrand Goldschmidt, chemistry director (exhibiting the first plutonium) and M. Paul Berthes, director at du Bouchet (right).

Atomic Pile Construction Stops

CONSTRUCTION of a third atomic pile at Sellafield, Cumberland, has been suspended as the result of a Ministry of Supply decision which followed the announcement in October by Mr. Attlee that Government departments were to cut their expenditure. Work on the other two piles is unaffected.

The third pile was planned to be larger than the first two, but so far only the foundations were being laid. Of the two now under construction, one has reached an advanced stage towards its completion. There is a prospect that work on it will now be accelerated. One of the principal functions of the Sellafield plant is the production of uranium and plutonium.

Radioactive Cobalt

RADIOACTIVE cobalt (C^{60}), which has been under investigation for several years as a possible substitute for radium in the treatment of cancer, is now being used experimentally, for the treatment of selected types of the disease at the Ohio State University School of Medicine. It can be produced in nuclear reactors. Whereas radium costs between $15,000 and $20,000 per oz., radiocobalt is available to cancer researchers at a minimum charge for handling. Moreover, somewhat better results are anticipated with its use as the gamma rays from cobalt made radioactive in the pile are said to have greater activity.

Strong hopes are entertained that large-scale use may be recommended.

SCOTTISH WOOD PULPING

First Plant Operates Next Year

THE creation of a paper pulp industry in the north-east of Scotland, the first of its kind in Britain, is nearing realisation and should be accomplished early next year. The sponsors, C. Davidson & Sons, Ltd., of Mugiemoss, have had the active support of the Forestry Commission, timber merchants, landed proprietors and the Scottish Council (Development and Industry) and the latter's intervention has facilitated the importation of special plant from the U.S.A.

The company is preparing to install at Mugiemoss the special defibrators, used to pulp the small timber on which the scheme will be based. The intention is to collect waste timber from a radius of 60 miles around Aberdeen, and plans are being prepared by landowners in the area to organise regular deliveries.

It is anticipated that some 4000 tons of timber annually will be used at the start. If the scheme succeeds, this tonnage is likely to be doubled as production scope increases. The immediate objective is the manufacture of fibreboard equivalent to the best now being imported from Canada and the U.S.A.; later, production may be extended into any field where pulp can be usefully employed.

Peat Prospects

SOME new possibilities of the industrial employment of peat were reviewed at the Royal Technical College, Glasgow, on December 3, by Sir A. E. McColl, of the North of Scotland Hydro-Electrical Board. He called attention to the effect of the changing economic and technical conditions upon the economic uses of peat and to its possible application to the gas turbine. That device offered the possibility of using peat to generate power at the actual peat bogs. The Secretary of State for Scotland and the Ministry of Fuel had arranged for the erection of pilot plants in Scotland to see what could be done towards the utilisation of peat in the generation of power.

In the past owing to financial costs, peat, as a fuel, could not compete on equal terms with coal. Important changes, however, had taken place during the past 40 years or so.

In 1905 the electrical concern which he was then connected with, was buying a

(*continued at foot of next column*)

certain grade of coal for the steam generation of electricity at 4s. 7d. per ton at the pithead. To-day they were paying 57s. for the same type of coal, but of an inferior quality.

It had been estimated that the thermal value of peat as utilised at present in the new power stations in Eire and elsewhere was something like an 18 per cent efficiency, which with the most modern equipment could be raised to 24 per cent, very nearly that of coal. In Scotland they had some 2 million acres of peatland.

ALCOHOL FROM PAPER PULP

By-Product Development in U.S.A.

A NEW waste-recovery by-product development, at present in its initial stages, is announced by the paper industry department of the Brown Instrument Co., New York. Half a dozen pilot plant operations are reported to have been started for the making of pulp-derived alcohol and other by-products. The types of alcohol now obtainable are stated to be suitable for rubbing preparations, and as ingredients in pharmaceuticals, perfume products, etc. While not at present produced in a sufficiently high grade suitable for human consumption, it is thought possible that, with additional refinements, grades to meet whisky requirements can be marketed.

The element in paper-making which provides the raw material from which the new alcohol is stated to be produced is the waste sulphite cooking liquor. Solids present in this contain about 20 per cent of fermentable sugars.

The highly corrosive nature of the liquor has been one of the major objections to using it as a source of alcohol. Moreover, mills lacked equipment capable of withstanding the strong acids. Now, however, new equipment capable of greater resistance is said to be obtainable at a relatively low replacement cost.

Other additional conservation measures being taken in the U.S. paper industry include what is known as the semi-chemical pulping process. This produces rougher paper products but makes it possible to use as high as 75 per cent of the original wood.

Other by-products obtainable from materials hitherto wasted in the U.S. paper industry include fusel oil, usable by the plastics and some chemical industries, saccharomyces yeast, cattle feed and chlorine and caustic soda.

STANLOW REFINERY STARTS

Initial Yield of 1M. Tons a Year

THE new Shell refinery at Stanlow, Cheshire, is now in operation, at least a month ahead of schedule. Last week the first main plant, a distillation unit and associated facilities, started up, manufacturing petrol and other petroleum products from Middle East crude oil at the estimated rate of approximately 1 million tons per annum.

After an eight-days' journey by road from Greenwich, a 115-ton, 84 ft. long oil tower reached its destination at the Shell oil refinery at Stanlow on November 29. It travelled at the rate of 30 miles a day through many large towns and cities.

Construction of the plant, achieved by a staff of some 1500, including those of the principal contractors, was commenced in 1948. The refinery is designed to refine 2.5 million tons a year of crude oil.

The Shell Petroleum Company's claim—that the principal contractors for the provision and construction of the plant are British—is indicative of the large advances which have been made in chemical and oil engineering here. Refined oil has, until now, had to be obtained from outside sources to supply the early chemical conversion processes.

The present stage of development shows substantial progress towards the final integration of refining operations, and chemicals manufacture on a single site.

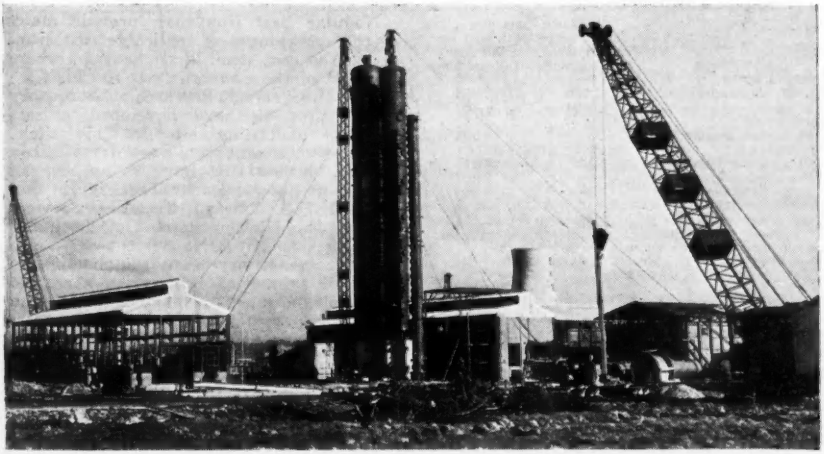
I.C.I. PROJECT OPPOSED

Fertiliser Plant near Morecambe

PROPOSALS by I.C.I., supported by the Board of Trade and Ministry of Supply, to erect a fertiliser plant and crushing mills at Middleton, near Morecambe, formed the subject of a Ministry of Health inquiry at Morecambe on November 30, when objections were heard from the Morecambe and Heysham Corporation and the directors of Middleton Towers Holiday Camp.

It was argued, for the corporation, that the plant would injure the amenities of the district, and was contrary to planning control. Witnesses for the holiday camp alleged that obnoxious smells emanated from the existing factory. The Lancashire County Council and the divisional planning authorities supported the proposal on the grounds that it was in the national interest, and recalled that in July 1948, the Ministry of Health, after a public inquiry, had decided in favour of the retention of the nearby wartime petrol refining factory. Mr. P. D. Inman, for the planning authority, said that the proposed development was the maximum to which they were prepared to agree.

The future of the fertiliser project now depends upon the Ministry ruling, which is awaited, based on the evidence at Morecambe.



The final stage in an operation which was carried through a month in advance of the programme: raising into position a fractionating column at Stanlow

Non-Ferrous Metal Stocks Reduced

October Output Slightly Lower

PRODUCTION of non-ferrous metals in October revealed a general decline compared with the previous month, and closing stocks at the end of the month also showed a small decrease on the September totals.

Details of production, consumption, and stocks (set out below) are abstracted from the summary issued by the British Bureau of Non-Ferrous Metal Statistics.

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS :		
Govt. and consumers	53,663	91,573
Imports	5,999	16,442
PRODUCTION :		
Primary	—	9,595
Secondary	2,268*	5,547
CONSUMPTION :		
Primary	9,704	27,027
Secondary	—	14,533
Exports	2,535†	1
CLOSING STOCKS :		
Govt. and consumers'	52,568	91,299

* Rough Copper

† Includes 780 tons rough copper dispatched to Belgium and 1,755 tons rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	24,816 long tons
Alloyed copper products	23,724 ,, ,,
Copper sulphate	3,858 ,, ,,

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS :		
Govt. and consumers'	32,239	73,862
Imports	10,406	4,500
PRODUCTION :		
Virgin and remelted	—	4,993
CONSUMPTION :		
Virgin (incl. debased)	6,170	18,216
Remelted and scrap	—	7,629*
Exports and Re-exports	—	180
CLOSING STOCKS :		
Govt. and consumers'	39,886	65,114

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons			
	Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS :				
Govt. and consumers'	—	61,491	1,903	—
Other stocks	9	—	—	—
IMPORTS	—	12,410	—	746
PRODUCTION	197	—	2,418	—
CONSUMPTION	136	13,937	2,044	12,530
Exports	—	51	—	—
CLOSING STOCKS :				
Govt. and consumers'	—	57,348	2,277	—
Other stocks	70	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,359
IMPORTS	2
PRODUCTION	1,971
CONSUMPTION	1,606
EXPORTS AND RE-EXPORTS	724

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	437
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	322

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	40.55

DUCTILE CAST IRON

Advantages Claimed for New Alloy

RECENT developments in nodular cast iron in the U.S.A., which follow the important work of the British Cast Iron Research Association in producing a cast iron containing nodular graphite in the as-cast state (THE CHEMICAL AGE, *58*, 616-618, 783-784), have attracted wide interest there from foundries and users of ferrous castings.

Nodular cast iron may provide many of the advantages of malleable cast iron, or even of cast steel, in applications where the cost of these materials is too high.

The U.S. Naval Research Laboratory now claims to have developed a safe graphite nodulising alloy.* This alloy, 8 per cent magnesium in a ferro-silicon carrier, is said to have a number of important potential advantages. Its use, states a U.S. Office of Technical Services report, would lower the cost of the nodulising treatment and lessen the danger of explosive reactivity when the magnesium is added to molten iron. In contrast to nickel-magnesium and copper-magnesium alloys, it presents no problem of excessive accumulation of nickel or copper in the recirculating scrap. The separate addition of a graphitising innoculant is said to be unnecessary.

* Report No. Pb—98919, "Recent Developments in Nodular Cast Iron," 50 cents : from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C.

GERMANS RESTORING PRODUCTION

Hope of Rapid Use of Reprieved Plants

NOW that a number of synthetic fuel and rubber works in western Germany have been excluded from dismantling, informed German quarters state that little harm has been done to key plant in the factories concerned by dismantling operations prior to the recent reprieve.

The synthetic fuel and rubber works removed from the dismantling list are those of Farbenfabriken Bayer, Leverkusen; Chemische Werke Huels; Gelsenberg Benzin AG, Gelsenkirchen; Hydrierwerke Scholven AG, Gelsenkirchen-Buer; Ruhroel AG, Bottrop; Ruhrchemie AG, Oberhausen-Holten; Gewerkschaft Viktor, Castrop-Rauxel; Krupp-Treibstoff-Werke, Wanne - Eickel; Steinkohlenbergwerk Rheinpreussen, Moers; Dortmunder Paraffin-Werke, Dortmund; and Chemische Werke, Essener Steinkohle, Bergkamen. Only in the case of Dortmunder Paraffin-Werke is the damage done said to amount to "millions of marks."

Efforts are now to be made to obtain permission for the restoration of the plants excluded from dismantling. The synthetic fuel plants of Gewerkschaft Viktor and Krupp - Treibstoff - Werke, which were to close down by the end of this year, are still in operation. The German interests concerned express the hope that the order to discontinue production in these works will be cancelled, and say they expect that "it is only a question of time when the synthetic and hydrogenation works rescued now will be permitted to resume production."

In the case of Farbenfabriken Bayer, an Anglo-German experts committee is to decide which parts of the central rubber laboratory are to be dismantled. Certain parts of the Huels plant have also been excluded from the dismantling stop on grounds of military security.

Chemische Werke Huels, in connection with the dismantling controversy, released certain information about "Emulsion 1078," a new product, introduced since the production of buna was stopped in 1948, which now accounts for 6½ per cent of the company's total turnover. Butadiene and styrol are the starting materials for the manufacture of the new product; up to 300 tons a month of butadiene can be used for this purpose.

While the Regional Economic Officer is of the opinion that "Emulsion 1078" must be classified as synthetic rubber, the management at Huels has maintained that the product cannot be used for making highly elastic rubber goods, like motor tyres, and should be described as an ancillary material.

West German Industries' Rising Capacity

FACTORY extensions and new plant construction are reported by several west German firms with chemical interests. The Esso refinery in Hamburg-Harburg, which resumed operations late in 1947, has completed another stage in its reconstruction programme and has raised its processing capacity by 105,000 to 560,000 tons of crude oil a year; ultimately the refinery is to treat 700,000 tons of crude annually. Deutsche Erdoel AG is erecting a new lubricating oil plant at Hamburg-Grasbrock which is to start the production of high-class lubricating oils and specialised products early in 1950.

Kali-Chemie AG intends to reopen the potash mine of Glueckauf-Sarstedt, near Hanover, which is now being rehabilitated, and is considering a plan for the erection of a chemical works in the vicinity. Internationale Galalith-Gesellschaft AG, Hamburg-Harburg, the most important firm in its field in Germany, is now producing 75 tons of casein resin a month and intends to raise the output to 100 tons a month.

Difficulties caused by high producing costs and increased competition are reported by a number of chemical firms in western Germany. Lias-Oelschieferwerke GmbH, Frommern, near Balingen, has announced that it will close down its works because the Wuerttemberg-Baden Government no longer pays it a subsidy. The firm, having invested substantial sums in new oil processing plant since the war, requires another Dm. 1 million to complete it .

Deutsche Asphalt AG, Brunswick, has been working short time for some time because of lack of raw materials; turnover in the first half of 1949 was 600 tons a month. Marketing difficulties have

forced the salt producers in the Heilbronn district to put off labour: the present turnover is between 30 and 40 per cent of the pre-war average, but repair work has made good progress of late.

Since the currency reform the west German pharmaceutical industry has not experienced any raw material difficulties, but raw material and other producing costs have risen, while selling prices in the home market have had to be left unchanged. German pharmaceutical exports at present amount to only a fraction of the pre-war volume, a fact which is due, in part at least, to the reluctance of German firms to export branded products to foreign countries in which German patent and trade mark rights are in abeyance or have been taken over by the Government. Some local subsidiaries of German pharmaceutical firms, especially in South America, have been expropriated, and the German suppliers are not willing to send pharmaceuticals and intermediates in bulk to these factories to be made up and packed on the spot.

The reconstruction of the sulphuric acid industry in eastern Germany has resulted in a substantial increase of production during 1949. In the first nine months of this year sulphuric acid production in the Soviet occupation zone is reported to have reached a monthly average 43 per cent above the level of the first half of 1948. The plant at Kanne (formerly owned by Kali-Chemie AG) has regained the output level of the pre-war years, when the capacity amounted to 17,800 tons (SO_3). The production of the former Fahlberg-List plant at Magdeburg is about 18,000 tons a year, and a new sulphuric acid factory was put in commission by Fertilia at Salzwedel in September, adding a capacity of about 10,000 tons a year. In 1950 it is proposed to raise sulphuric acid production in the Soviet zone by 90 per cent above the 1949 level, largely by reconstruction of the plant at Wolfen, which the Russians dismantled. The capacity of this plant may ultimately reach 70,000 tons (SO_3) a year, but the work is not likely to be completed before the latter part of 1951.

Soviet zone reports claim that potash production has now regained the pre-war level. In 1949 production was expected to total 1 million tons (K_2O), but in fact it will probably be several hundred thousand tons larger. Plans for 1950 provide for a further increase of 50 per cent. Production of fertilisers in general is scheduled to be increased by 110 per cent next year.

Norway Investigating Seaweed Source of Chemicals

ATTENTION is drawn to the potentialities of the Norwegian seaweed industry in a report issued by a committee of the Royal Norwegian Council for Scientific and Industrial Research, which recently founded a special research institute for the study of marine algae and the methods by which this resource can be most profitably exploited. In this they are working along lines comparable with the investigations which have been carried on in Britain in recent years (THE CHEMICAL AGE, *61*, 339 and 347).

The report states that there is probably a greater profusion of brown algae along the coast of Norway than in any other European country, and that it is primarily on this type that an expansion of the Norwegian seaweed industry would have to be based.

The new institute for seaweed research will be housed in provisional quarters in the grounds of the Oslo University at Blindern. It will be organised in a botanical and a chemical department, with three scientists in the former and one in the latter, in addition to other personnel. It will be headed by Prof. Henrik Printz, now on leave of absence from the Norwegian Agricultural College.

In a recent interview, Prof. Printz pointed out that the annual output of the Norwegian seaweed industry has to-day a value of about Kr.3 million. There are at present two Norwegian producers in the field: A/S Protan, of Drammen, which is mainly engaged in the manufacture of alginates, and Algea Produkter A/S, of Kristiansund, whose principal product is seaweed meal.

Prof. Printz maintains that, granted favourable market conditions, Norway, with her enormous seaweed resources, should be able to expand the value of her output of seaweed products to Kr.50 million per annum. Considering to what type of production such expansion of the industry should be primarily directed, the professor said that the extraction of alginic acid would, in his opinion, offer the greatest possibilities.

The Norwegian species of seaweed that, according to Prof. Printz, could be most profitably turned to account, are different species of laminaria and the very valuable ascophyllum.

ULTRA-VIOLET RADIATION TECHNIQUES

Versatility of New Industrial Equipment

THE extreme versatility of ultra-violet radiation continues to be recognised by the adoption of the principle for a growing range of industrial and laboratory techniques, especially as a ready method of identification, of sterilisation, of producing accelerated weathering and latterly as a means of bringing about chemical changes.

Wavelength Energy

Ultra-violet rays, the practical applications of which were the subject of a most comprehensive demonstration in London last week,* derive their potency from the energy conferred by their shorter wavelength, in relation to visible light. That energy is capable of effecting chemical changes and reactions—photo-chemical reactions, photo-physical and photo-biological changes.

In some of the numerous chemical effects ultra-violet rays are somewhat analogous to catalysts, facilitating combinations of substances, while the conversion of gases to liquids and liquids to solids by the influence of such radiation has become established practice. One familiar industrial use is the exposure of leather, treated with a suitable varnish, to produce patent leather, while more recent development has conferred important uses in several branches of the plastics industry.

One of the more recent examples of the latter use of ultra-violet radiation is to permit the " cold welding " of Perspex acrylic sheet, which can be cemented so that the join does not interfere with the almost perfect optical properties of the material. By applying a cement to the pieces to be jointed and irradiated, the photochemical change which converts the join into solid, homogeneous Perspex is brought about. This method is used by Thermoplastics, Ltd., and the plastics division of Imperial Chemical Industries, Ltd.

Of even wider potentialities is the capacity to promote isomerisation, for which, it is recorded, Glaxo Laboratories, Ltd., is successfully employing ultra-violet radiation to convert ergosterol into calciferol (vitamin D_2).

* Presented by Hanovia, Ltd.

The Hanovia Prospectorlite, a new battery-operated instrument to detect uranium and tungsten minerals by the strong fluorescence response

Town-Planning Intervenes

THE problem of ideal planning versus industrial development has been raised in an acute form in Edinburgh where T. & H. Smith, Ltd., manufacturing chemists, is seeking powers to erect a new boiler house across the railway line opposite its Blandfield Chemical Works. The Town Planning Officer's recommendation that this should not be permitted and that the factory should move to another location was opposed by members of the Planning Committee. Such a transfer, they pointed out, might involve a huge expenditure. No firm could be expected to provide this merely to satisfy aesthetic considerations.

The present factory had been described as " definitely a noxious industry " and too near housing. For the firm it was stressed that the product manufactured was in world-wide demand and that extension to the present factory would permit employment of a further 300 people.

The committee agreed by 5 votes to 2 not to oppose the firm's plan for a new power house.

Selective Use of Trace Metals

Important Future Factors in Biochemistry?

A NUMBER of suggestive indications of the possibility of employing the widening understanding of the rôle of trace metals in biological processes to destroy pathological organisms were mentioned by Prof. A. Albert (National University of Australia) in the course of a paper recently presented at Cambridge University. The occasion was a joint meeting of the Royal Institute of Chemistry (London and south-eastern counties section) and the Cambridge University Chemical Society, at which Dr. F. G. Mann, F.R.S., presided.

Prof. Albert, discussing chemotherapy and essential trace elements, reviewed the diversity of metals which living cells of different sorts required, such as iron, copper, cobalt, manganese, zinc, gallium, vanadium and molybdenum. All these trace metals were potentially toxic, in excess, but different species had different toxic doses and also different minimal requirements.

Metallic Ions

The question arose, what was the extent to which a special branch of chemotherapy could be consciously developed, one that would depend on increasing the concentration of a metallic ion above the tolerance limit for the parasite but below the tolerance limit for the infected tissues of the host. Or conversely, one that would depend on decreasing the concentration of an essential metallic ion below the minimum compatible with the life of the parasite but above the minimal requirements of the host.

Complexing agents, in particular those chelating agents used by analysts to segregate traces of metallic ions, provided the rough prototypes for the kind of drug envisaged. Few of these spot-test reagents, however, were able to segregate metals under physiological conditions (say 37° C. and *p*H 7.3) (Albert & Gledhill, 1947).

In Nature, the essential trace-metals were held by chelating agents such as the pteridines and aminoacids, so that a drug would require to compete with these for the metals. This competition would be the more successful, the higher the stability constant (K_s) of the new complex compared with the old.

$$K_s = \frac{[\text{complex}]}{[\text{complexing agent}]^{n}\,[\text{metallic ions}]}$$

where n is the valency of the metallic ion.

These constants, which could often be determined by potentiometric titration, revealed that the majority of known complexing agents combined preferentially with metals in a fixed order—the Mellor & Maley series:—

Cu>Ni>Co>Zn>Cd>Fe>Mn>Mg.

However, a few truly specific reagents are known, *e.g.*, dipyridyl and *o*-phenanthroline for ferrous iron. Other examples should now be sought.

8-Hydroxyquinoline, which has been used for 50 years, as a powerful local antibacterial agent, had recently been shown to function by disturbing the distribution of trace-metals in bacteria (Albert, Rubbo, Goldacre & Balfour, 1947).

In *Staphylococcus aureus*, a small concentration of 8-hydroxyquinoline disturbs glutamic acid metabolism, apparently by removing manganese from the cells (Gale, 1949). However, the death of these organisms, brought about by higher concentrations, is caused by the drug transporting iron (which it holds, rather loosely, in a liposoluble form) from the medium into the cell interior (Rubbo, Burvill & Albert, unpublished). In the absence of iron in the medium, this drug was not even bacteriostatic.

8-Hydroxyquinoline and its derivatives were of limited use in chemotherapy as they are inactivated by blood. Further study of fundamentals should, however, lead to the discovery of new types of drugs acting by interfering with trace-metal metabolism but having a wider range of usefulness.

Science Exchanges

EXCHANGE of scientific and technical knowledge to promote industrial efficiency has been planned by 18 Marshall Plan nations, states the council of the OEEC. The decision is based on a report by a specialist working party headed by Dr. Alexander King.

Documents on physical and biological sciences, technology and medical matters relating to industrial production are to be supplied by each member nation to all other members; national centres to receive and despatch such literature would be established. In Britain, TIDU will collate and distribute the reports.

RADIOACTIVITY AND BIOCHEMISTRY

The Royal Society Identifies Some Pioneers

SOME decisive events in the early development of radioactive isotopes and their use in biochemistry and other milestones in the growth of atomic physics were reviewed at the recent anniversary meeting in London of the Royal Society, at which the two Royal medals and the society's medals for 1949 were presented by the president, Sir Robert Robinson, O.M. (THE CHEMICAL AGE, *16*, 711).

In a series of authoritative appreciations of the work which the medals commemorated, Sir Robert Robinson made clear the pioneering character of the studies by Prof. George C. de Hevesy (Copley medallist) of the chemistry of radioactive elements and of the use of isotopes as tracers in biology.

When working under Rutherford in Manchester, the president recalled, Hevesy turned his failure to separate radium-D from lead to good advantage. He recognised that the identity in chemical properties of radium-D, and other radioactive isotopes of lead, with ordinary lead, made it possible to use these radioactive isotopes as indicators to follow the behaviour of lead in chemical processes, and in great detail, owing to the extreme sensitivity of the methods of detection of radioactivity. The first application of the idea was made with Paneth in 1913 at the Radium Institute of Vienna.

Tracer Technique

The use of radioactive isotopes as indicators or " tracers " in biological processes was initiated in 1923 by Hevesy's studies on the uptake and distribution of lead in bean plants, using radioactive lead, radium-D or thorium-B, as indicators. After placing bean plants in solutions of ordinary lead nitrate containing small amounts of radium-D nitrate, the distribution of the lead was followed by determining the radioactivity of the ash from the different parts of the plants.

This work might truly be said to have marked the opening of a new chapter in biochemistry. Furthermore, it established a pattern for the numerous subsequent researches by himself and by others which were to follow the discovery of artificial radioactive elements and the development of methods for the separation of certain stable isotopes.

Hevesy was one of the first to appreciate the potential biochemical importance of Urey's discovery of deuterium in 1932. In the following year, by experiments with fish placed in water containing added D_2O, he and Hofer showed that there is a rapid exchange between environmental water and that in the body and also that there is an exchange between the hydrogen of the environmental water and labile hydrogen atoms in the tissue constituents. In 1934 they established the very important fact that at the low concentrations of D_2O present in ordinary water the human body does not discriminate between D_2O and H_2O.

Phosphorus Investigation

In 1937 Hevesy and his co-workers again broke fresh ground by their use of the radioactive isotope of phosphorus, P^{32}, as a tracer in studies of the metabolism of phosphorus compounds. It was found that the average time during which a phosphorus atom remains in the body is 30 days.

Having established by *in vitro* experiments that there is no direct exchange between organic ester phosphate and inorganic phosphate, Hevesy and his coworkers were able to determine the " turnover " rates for certain organic phosphorus compounds in the body by isolating these compounds at intervals after the administration of labelled phosphate and estimating their content of radioactive P^{32}.

Hevesy and his collaborators obtained P^{32} labelled adenosine triphosphate enzymatically from labelled inorganic phosphate, and clarified the rôle of this compound as a phosphate donor in carbohydrate metabolism. Further, their studies on the phosphatides in the liver and blood plasma supported the view that the plasma phosphatides are synthesised in the liver.

The president also gave appreciative summaries of the prime achievements of the other medallists: Professor Sir George Thomson (atomic physics and the wave properties of the electron); Professor R. Peters (biochemistry and vitamin B_1 in tissue metabolism); Professor A. R. Todd (organic chemistry and biochemistry, especially in relation to vitamins and nucleosides); Professor L. J. Mordell (researches in pure mathematics); Professor C. F. Powell (experimental physics and discovery and study of mesons).

Problems of Variable Composition

French Views of Non-Stoichiometric Materials

From A SPECIAL CORRESPONDENT

UNCONVENTIONAL views on the behaviour of non-stoichiometric compounds, silicates, alloys, etc., which do not obey the Dalton theory have been presented in Paris by Prof. Jacques Bénard, who has suggested the prospect of wider industrial applications of some of these characteristics.

These "non-conforming" compounds, the professor observes, have long complicated the theories of classical chemists and there has been insufficient study of the observed eccentricities, notwithstanding the brilliant work of Hagg (Sweden), Chaudron, Faivre and Guillaud (France) and Verwey (Holland).

Examples

Using the modern atomic theory of structure as well as the quantum theory as a base, M. Bénard demonstrated, before the Société d'Encouragement pour l'Industrie Nationale, that variable composition compounds exhibit a defined character; their atomic structure may be visualised either by substituting or by inserting ions in a crystalline lattice. For instance, mixed crystals of NaCl + BrCl have a lattice in which the Na ions have kept their usual places and the Cl and Br ions have taken at random the other places reserved either to Cl or to Br ions in the lattice of the corresponding chloride or bromide.

Another example given is derived from the spinels (Fe_3O_4 compounds); there is an actual substitution of Fe_3 by $Al^{\cdots}$, $Cr^{\cdots}$, etc., ions in the molecule and of Fe_2 by such divalent ions as Mg, Ca, Mn, etc.; even Fe, may be substituted by Fe_2 in the spinel molecule.

The appearance of non-stoichiometric combinations of CdO, containing an excess of Cd may be explained by the insertion of Cd ions between the regular ions of the lattice; there is a molecular dilatation. An even more unorthodox result is noticed when NiO is considered; a loss of Ni atoms seems to take place. Prof. Bénard gives the substitution of $Ni^{\cdot\cdot}$ by $Ni^{\cdots}$ as an explanation of the observed facts, following the equation:

$3\ Ni^{\cdot\cdot} \rightarrow 2\ Ni^{\cdots} + Ni$ (escapes).

M. Bénard boldy concludes that any solid ionic compound is liable to defy Dalton's law. He has added to this purely scientific conclusion a practical development in the form of some contemporary technical applications of non-stoichiometric compounds.

Non-stoichiometric compounds, especially spinels, have, unlike metals, an electric conductivity increasing with temperature increase. Advantage is taken of this in making sensitive instruments for measurements in the infra-red spectra, in controlling thermostats, making thermal safety relay transformers, creating circuits not sensitive to temperature changes and in electronic appliances.

A mixed core of spinel and carbonyl iron will preserve a good permeability and will not sustain heavy losses through eddy currents. Applications of this property are suggested in the transformer, high frequency and permanent magnet industries.

Activators, such as copper, manganese, etc., will excite fluorescence in CdS, $CdgI_2O_1$, etc, if such activators are substituted in the ion state in the molecular lattice of these non-stoichiometric compounds.

In rectifiers, the part played by CuO may be explained by the non-stoichiometric character of the molecule which changes CuO into a semi-conductor. In catalysis, the part played by promoters might be explained by their entering non-stoichiometric molecules and replacing ions in such molecules.

A Natural Pressure Vessel

A UNIQUE plant for testing jet units requiring a large supply of high-pressure air is being constructed in Sweden in the rock 279 ft. below the Göta river.

The weight of the river water will be employed, through a shaft, to compress air in a chamber with a capacity of 10,000 cu. m. (353,170 cu. ft.) holding 120,000 kg. of air for use in the laboratory. When emptied the chamber can be reloaded in 18 hours by three suction compressors, totalling 600 h.p., which force the water back into the river.

The chamber can deliver a quantity of air sufficient for a test of 40 minutes' duration with the new types of jet engines now under construction, which consume 50 kg. of air a second.

FLUORESCENT MATERIALS FOR TEXTILES

*Successful Uses in Bleaches and Dyestuffs**

by R. W. MONCRIEFF

MOST fibres are slightly yellow; particularly does this apply to hair fibres such as wool and alpaca. Even with a single kind of fibre, such as sheep wool, the degree of yellowness will vary considerably from one quality of fibre to another, but all are slightly yellowish.

The traditional methods of whitening such fibres are, as pointed out by Edwards[3]: bleaching, loading with a white pigment, and blueing.

Bleaching is indispensable, and even with the introduction of fluorescent optical bleaches it is unlikely that the traditional methods of bleaching, such as treatment of cellulosic materials with hypochlorite and of wool with sulphur dioxide or with hydrogen peroxide, will be displaced. Rather will the optical bleach be used to enhance the whiteness (or the purity of pastel shades).

In some cases, however, although they may be relatively few, the use of an optical bleach will enable a traditional bleaching process to be eliminated, but in the main it seems that at present optical bleaches should be considered as agents to be used to improve the bleach that is normally given. Time may, of course, show that optical bleaches will replace traditional bleaches to a greater extent than now seems likely.

Titanium Dioxide

Loading a fibre with a white pigment is a method not very widely used. It suffers from the disadvantage that a heavy application of pigment may seriously alter the handle of a fabric and may make it wear badly because of the increased friction that results; in addition, the loading may not be fast to washing. The incorporation of a white pigment, such as titanium dioxide in rayon yarns, is rather a different matter; this pigment is fast to washing, but it is applied more to reduce lustre and give a matt or pearl appearance than to whiten the yarn.

Blueing has been carried out in the home and in laundries as well as in the dyehouse. If a fibre looks yellow it is because it reflects more yellow light than the balance of all colours which is required to give a white. If, therefore, a blue pigment is added, this absorbs more and reflects less of the yellow light so that the fabrics appear to be white. Ultramarine is the "blue" that has usually been employed for this purpose. Disadvantages attached to the use of such a "blue" are: The quantity of light reflected by the fibre (or fabric) is reduced, for in addition to the light normally absorbed by the fibre, additional yellow light is absorbed by the "blue." The overall brightness of the fabric is therefore reduced. Sometimes fabrics are overblued; too much blue is applied and the fabric that formerly was slightly yellow becomes noticeably blue, whereas what is required is a good white. The blue is not fast to washing, but has to be re-applied after each wash.

Light Intensity

If, however, instead of applying ultramarine to a fabric, a substance is applied which is colourless but which absorbs ultra-violet light and re-emits it as blue light, the surplus yellowish light reflected by the fabric is neutralised by the added blue light. But this time there is no diminution in the overall intensity of the light reflected by the fibre; on the contrary, there is an increase in the reflected light. All the visible light that was previously reflected by the yellowish fabric is still reflected after the fluorescent substance has been applied to it *plus* the blue light into which the fluorescent substance has transformed the ultra-violet light that fell on it.

These ideas appear to have been first stated by Krais[4] after von Lagorio[5] had previously pointed out that the visible light reflected from fluorescent materials tended to exceed the incident light, and that in the Ostwald system of measuring colour, the white content of the reflected light might be increased by the use of fluorescent dyestuffs.

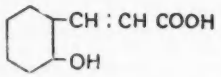
This apparently suggested to Krais that a colourless fluorescent substance might be used to increase the whiteness of textiles. Krais actually proved his case by applying aesculin (the fluorescent material present in horse-chestnut bark) to textiles, and finding that their whiteness was increased. Aesculin is a glucoside of 6.7-dihydroxycoumarin; it is interesting to note that it belongs to the coumarin family, because β-methyl umbelliferone,

* Continued from page 768, December 3, 1949.

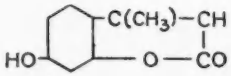
which has also been used commercially as an optical blue, is also a substituted coumarin.

Optical bleaches are used in such small quantities that they have no effect on the handle or wearing properties of fabrics. Some of the early examples that were used were not fast to washing, but new substances have been prepared which fluoresce blue and which are also substantive to fibres, so that this difficulty has now been overcome.

Coumarin is the internal anhydride (or lactone) of coumaric acid which itself gives a yellowish-green fluorescence in alcoholic solution:—



Umbelliferone is a hydroxycoumarin and its derivative—methyl umbelliferone—fluoresces blue:—



The application of methyl umbelliferone to textiles was proposed by Lever Bros. *et al*[7] to eliminate the yellowish or off-white tint of textiles. This could be done by treating the fabric or yarn in a very dilute solution of methyl umbelliferone. The writer tried this process on wool and found that it gave a remarkable brightness.

There was not the slightest doubt that the improvement in colour was very substantial; an ordinarily good commercial white wool looked quite dingy compared with the treated wool. Unfortunately, the β-methyl umbelliferone was rapidly removed on rinsing or washing and the improvement in the whiteness was very largely lost on the first wash.

Coumarin

The use of blue fluorescent coumarin derivatives, notably umbelliferone or β-methyl umbelliferone, was also suggested by Lever Bros. *et al*[7] for whitening soap. A further improvement could be effected by using a small amount of a blueing agent as well as the blue fluorescent compound. Thus a white soap of excellent colour was obtained by incorporating in the soap: 0.02 per cent β-methyl umbelliferone; 0.00003 per cent indigo.

Two advantages were derived: the soap was whiter and more attractive; goods washed with the soap would also be whiter. The great disadvantage was that the whiteness was not fast to washing.

Ultrasan was the fore-runner of the Blankophors, which were the first optical bleaches to be used commercially. Its use in paper for wrapping was described by Eggert and Wendt.[8] Originally, it was used as an absorbent of ultra-violet light to protect butter and similar materials wrapped in paper impregnated with it from decomposition due to reactions that were stimulated by ultra-violet light, and so to reduce the tendency to go rancid.

Later it was discovered that Ultrasan would whiten paper and that it had a high affinity for cellulosic fibres. It was manufactured in the period 1938-41 and in 1941 it was also marketed for textile purposes under the name Blankophor B.

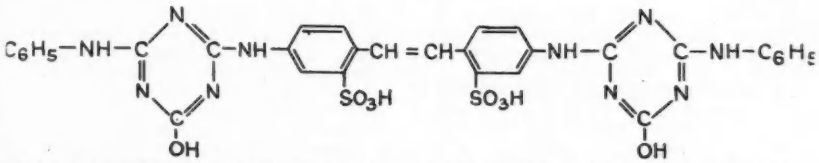
Optical Bleaches

The Blankophors were optical bleaching agents that were developed by I. G. Farbenindustrie before the 1939-45 war, and which were well received and rapidly adopted by the trade. Their manufacture was later discontinued owing to the exigencies of the war, but at least one member of the series of compounds has again been produced, since the termination of the war. Their history, manufacture and use have recently been described.[9] They were fluorescent materials, which when applied to textiles or to paper increased the total amount of reflected light; they were colourless—an essential characteristic of optical bleaching agents—and they were fairly fast to washing.

They were, however, not quite perfect, although they were sufficiently good to secure wide adoption. The defects from which they suffered were: They did not fluoresce satisfactorily in artificial light. But it should be added that if artificial light fluorescence is to be regarded as a criterion for a satisfactory optical bleaching agent, it is one that will be very difficult to meet, because most fluorescence is due to the action of ultra-violet light, and artificial light as commonly used is only very poor in ultra-violet. They did not show satisfactory stability when directly exposed to the sun.

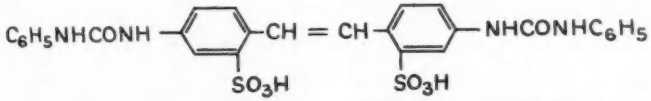
Four kinds of Blankophor were made and used. They were as shown below.

In the concentrated form it was identical with Ultrasan. It was diluted with urea (10 Blankophor B Conc. 90 urea) and sold as Blankophor B. Its active constituent had the formula which is printed at the top of facing page.



The conjugated system of double bonds, to which the fluorescent properties are due, may be noted. All that was necessary to treat cotton with it, was to immerse the cotton in a 0.1 per cent solution of Blankophor B, using a 30:1 volume ratio. The Blankophor was fairly fast, *e.g.*, after four rinses each of 15 min. in cold water only about 13 per cent of the Blankophor was removed, and even after boiling for half an hour in soap and soda solution only about another 14 per cent was removed. The fastness of Blankophor B to light was about 4 (maximum 8), which is moderately good.

Blankophor R is a substance which appears to have been made and used because one of the intermediates required for the manufacture of Blankophor B was unavailable during the war period. It had the constitution:—

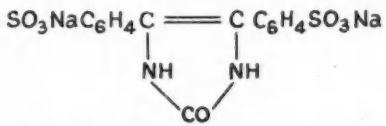


and was sold as a 7.4 per cent dispersion in urea. It fluoresced purple and was inclined to give the fabrics a reddish tinge. Once again the conjugated system of double bonds is evident.

Blankophor R G was designed to overcome the reddish tinge of Blankophor R; it consisted of Blankophor R Conc. to which 2½ per cent Anthranal Green G G Conc. was added. The green dye neutralised the reddish tinge and was thought also to improve the appearance of treated fabric where examined under artificial light. This is the blend which has been sold since the war ended.

Water-Solubility

Blankophor W T was intended for application to wool and silk; the other Blankophors had a marked affinity only for cellulosic fibres. It was known that the condensation product of benzoin and urea had some of the properties required in an optical bleach for application to wool, but it lacked water-solubility. Accordingly, it was sulphonated and thus made water-soluble, and was adopted for use with wool in 1942. It is the sodium salt of diphenylimidazolene disulphonic acid:—



Blankophor W T had a light fastness of 4-5, which was fairly satisfactory. It was applied to wool as about a 0.05 per cent solution, using a 50:1 volume ratio for 15 min. at room temperature. It was essential for the bath to contain about 0.05 per cent formic (or sulphuric) acid. It had an affinity also for nylon. In addition to being used to improve the whiteness of whites, Blankophor W T was also used to improve the contrast of prints and also as a laundering asistant. In the latter case it was added to the last rinse. It was not stable to chlorination, but as it is more likely that it would be applied after than before a non-shrink treatment, this may not be a serious detriment to it.

The application of the Blankophors was discussed by Michel.[10] He stated that Blankophor B is suitable for bleached cotton, semi-bleached linen, and slightly bleached or unbleached staple rayon and rayon.

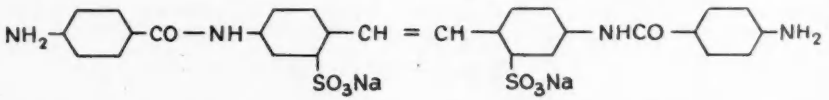
The Lumogens comprised a group of fluorescent water-insoluble pigments intended to have practically the same colour in ultra-violet as in daylight. They were used for colouring maps, etc., which could be read at night by ultra-violet light, *i.e.*, they could be read in the dark. Because of their close relation to optical textile bleaching agents, it seems advisable to mention them here.

Two members, Lumogen Blue (2-5 dihydroxy terephthalic acid ester of ethyl alcohol) and Lumogen Water Blue (dixanthylene), were nearly colourless and had a blue fluorescence, but owing to their water-insolubility could not be used in a

similar way to the Blankophors. If applied to cellulose acetate from organic solution the product "showed startling brilliance."

The use of methyl umbelliferone had been advocated by Lever Bros. *et al*, who had shown also that its efficacy was even greater in the presence of a small amount of a blueing agent such as ultramarine, but its defect of too ready water-solubility combined with lack of substantivity for the fibre rendered it unsuitable for many purposes. Water-solubility is not a defect provided that a substance has an affinity for the fibre, but if it has no such substantivity and is also very water-soluble it washes out too easily.

This defect was remedied in B.P. 584484.[11] In this specification there was described a range of blue—fluorescent substances which had a substantive affinity for wool, and which accordingly were fast to washing. These included a range of diaminostilbene sulphonic acid derivatives. Typical of these is 4,4′-di-*p*-amino benzoylamino stilbene 12,2′-disulphonate:—

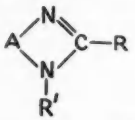


The range included some derivatives of benzidine and of benzothiazol. The intention was to add the blue-fluorescent agent in small proportion to the soap, and then when wool was washed with the soap the blue-fluorescent agent would dye on to the wool. It was reported that when quantities of fluorescent agents of the order of 0.02 per cent were incorporated in the soap, and textile materials were washed in a 0.4 per cent solution of the soap and rinsed at least twice in clear water, "the finished materials were of a much whiter and brighter appearance than similar materials laundered in a control test."

The addition of similar fluorescent materials to the textile treating bath directly instead of incorporating them in the soap, was suggested in B.P. 584436. It was later reported by the same inventors[12] that stilbene derivatives, such as that described above, suffered from two disadvantages: they were detrimentally affected by sodium hypochlorite and similar solutions that might be used in laundering for the removal of stains; they discoloured on long exposure to light.

It was stated that if the terminal—NH_2 groups of the stilbene derivative were converted into—$NHCONH_2$ groups, as in the compound 4.4′-di-*p*-ureidobenzoylaminostilbene-2,2′-disulphonate, these defects were avoided. The use of these ureido-compounds appears to have been recommended chiefly for cellulosic material.

The preparation and use of cyclic amidines which exhibit a blue to violet fluorescence has been described by Graenacher, Ackermann and Ciba. Ltd.[13] in U.S. Patent 2463264. According to this, in cyclic amidines of the general formula:—



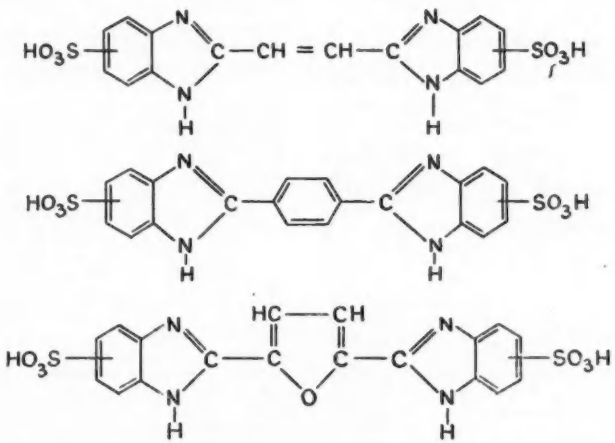
A represents an aromatic nucleus, R′ represents H or a substituent, *e.g.*, benzyl or a hydroxyalkyl radicle, and R represents an alkyl radicle preferably unsaturated in the $\alpha:\beta$ position or various other substituents. Such substances are preferably sulphonated to give water-solubility, so that they may conveniently be used in the form of aqueous solutions.

Typical compounds which accord with this specification are the disulphonic acids of the formulæ shown at top of facing page.

It will be seen that all these three substances are similar except for the group which joins the two cyclic amidine groups and which is respectively in ethylene, phenylene, and furylene. It may be noted, too, that in each case this group forms a series of conjugated points of unsaturation with the amidine nuclei. The blue-violet fluorescence of these compounds appears to depend on the presence of such a series of conjugated double bonds.

Such substances, although rather complex in structure and requiring complicated syntheses, are very simple to apply. If, for example, bleached cotton yarn is treated for 30 min. at 20° C. in a bath containing about 0.2 gm. per lit. of the sodium salt of the substance 2, which is 1:4-di-[benzimidazyl-(2′)]-benzene in a 50:1 liquor ratio, and is then rinsed and dried, its whiteness is much improved; it is said to possess "a higher white content" than the untreated material.

This is, of course, due to some of the ultra-violet light which falls on the treated fibre being converted to bluish visible



light, which not only neutralises any yellowish or brown discolouration of the fibre, but also increases the total quantity of visible light that is reflected by the fibre.

Although every one of the many examples given by Ciba, Ltd., in this paper relates to the application to cellulosic materials of the fluorescent materials, it is stated that they may also be applied to wool, silk or synthetic polyamides. The unvarying choice of cellulosic materials in the examples suggests that the affinity of these fluorescent compounds is greatest for cellulose, and that the fastness on wool may not be good.

Not only can these compounds be used to improve the whiteness of white materials, but they may also be used to give much better contrast on prints. If, for example, a two-colour print is treated with one of the fluorescent agents, the whiteness of the white parts will be greatly improved so that the print gains in clarity, contrast and brightness.

Rhodamine Dyestuffs

It seems clear that if a dyestuff of one colour could be used in conjunction with a material which fluoresced in the same colour, a much brighter shade should result. The Rhodamine dyestuffs are themselves flourescent, and when dyed on wool will give (with Rhodamine B) a pink of superlative purity, due doubtless to the augmentation of the reflected by the re-emitted light. Unfortunately, these dyestuffs are not very fast to washing. The writer was able to produce good bright pinks by using a faster dyestuff, such as Kiton Red G, in conjunction with a very small quantity of red-fluorescing agent. Various derivatives of fluorescein were tried.

Fluorescein is itself a dyestuff but finds little application as such because of the fugitiveness of its dyeings on wool. Its sodium salt is highly fluorescent and is marketed as Uranine. Its halogenated derivatives include eosin, which is potassium tetrabromofluorescein, and erythrosine, which is the disodium salt of tetraiodofluorescein. Either of these wll give brilliant pinks or reds when dyed on wool, but they are so fugitive to light that the colour is noticeably faded after an exposure of only half an hour.

A Brighter Pink

It was found that if a very small quantity of erythrosine was added to a Kiton Red G bath, wool dyed pink in it was very much brighter and purer than usual, but unfortunately the erythrosine was fugitive, and on exposure to light or to washing the increased brilliance of colour diminished. There are, however, other substances that fluoresce red, and a search for one that was fast to light and had substantivity for wool might be rewarded.

A somewhat similar principle, that of augmenting the shade of a dyestuff by a fluorescent materal which emits light of a similar colour, is involved in the addition of a fluorescent pigment in rayon yarn, described below.

Advantages are claimed for the incorporation of a fluorescent pigment in rayon yarns, particularly those of cellulose

acetate, by British Celanese, Ltd., in a recent patent.[14] It is stated that the pigment in a very fine state of division is preferably introduced into the dope at a point near the spinning jet, so that only the minimum part of the spinning system will become contaminated with the pigment.

If a pigment which has a reddish fluorescence is incorporated and then the yarn is subsequently dyed red with a red-fluorescent dyestuff, the combined fluorescence from pigment and dyestuff give an exceptional brilliance of shade and intensity of colour. An example suggests the use of 4 per cent zinc sulphide on the weight of cellulose acetate, followed by dyeing with Rhodamine B in the presence of formic acid. The fabric so dyed and then finished "exhibits a brilliant red colour when viewed under daylight and an intense brilliant red colour when illuminated by ultra-violet light."

Suitable Pigments

According to the colour that the yarn is to be dyed, one of the following pigments should be used: red—zinc sulphide or mercuric oxide or Rhodamine BX tungstate lake; blue—peacock blue lake; green—zinc sulphide suitably prepared of a green daylight colour or brilliant green tungstate lake or malachite green tungstate lake; violet—ethyl violet tungstate lake.

Suitably fluorescent dyestuffs are: For cellulose acetate—Alizarin blue SAPX (C.I. 1054), Rubine A W (CI. 677), Alizarin green C G (C.I. 1078), Rhodamine 6 G (C.I. 752), Auramine O (C.I. 655), Thioflavine T (C.I. 815), Calconese fluorescent yellow, Calconese invisible blue, and navy blue R (C.I. 922 and 680). For cellulose—Chlorazol yellow 2 GS, Immedial yellow G. G. (C.I. 955), Primuline A S (C.I. 812), Oxamine red BN. Thiazone red 6XX, Thioflavine S (C.I. 128). For polyamides, *e.g.*, nylon—Rhodamine B (C.I. 749), Milling orange C, Milling red C, ink blue G (C.I. 707).

In a similar connection, it is interesting to note that Arkin and Singleterry[15] have shown that certain dyes which are not ordinarily fluorescent will fluoresce if adsorbed on an oil-dispersible metal soap. This behaviour is expected to be taken advantage of in the development of fluorescing agents.

It seems to have already been clearly established that brilliant whites can be obtained by the use of optical bleaching agents. Fabrics that have been treated with these reflect more light than falls on them; whereas traditional blueing agents inevitably reduce the overall brightness, these new optical agents increase it.

Several of these agents are already on the market; the Blancophors were the first to be used commercially, and Tinopal B V made by the Geigy Co., Ltd., has been in use for some years. Others have recently made their appearance and as a class they should be sure of increasing use. Pastel shades of greater purity are obtainable by their use owing to the reduction of the flattening effect of the yellowness of the natural fibres.

Probably, too, a new range of fluorescent materials will be developed which will augment the colour of dyestuffs, and these should result in the production of textiles in colours more brilliant than have yet been seen.

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(*Concluded*)

Commercial Supplies of Indium

THE Consolidated Mining and Smelting Company of Canada has announced the addition of indium to its list of products. Although this is one of the rarer metals, it is now available in commercial quantities, the result, it is said, of prolonged research at the company's works at Tadanac, British Columbia. The large-scale operations at Tadanac have made it possible to recover and refine indium from the minute quantities present in the ore from the Sullivan mine. All the metal produced will be of 99.99 per cent minimum purity.

Several of the large mining companies in the U.S.A. are producers of indium, but its limited use has been confined to dental work, some kinds of plating, as a non-tarnishing agent on silverware, and for motor bearings. During the war, certain high speed aeroplane motor bearings were indium-treated. The Consolidated Company hopes by further research and development to broaden the field of possible utility of this metal.

LIQUID ROCKET FUELS

Problems of Handling Demand Special Materials

THE chemistry of rocket fuels, and the problems involved in handling such highly oxidisable materials, were discussed by Dr. J. G. A. Griffiths, chairman of the London and South-Eastern Counties section of the Royal Institute of Chemistry, in an introductory talk prior to the showing of the films "Operation Back-fire" and "Rocket Flight," at a recent meeting.

The fuel might be liquid or solid, said Dr. Griffiths; in the first case, a number were available, such as alcohol and liquid oxygen, petrol and liquid oxygen, liquid hydrogen and liquid oxygen, or liquid hydrogen and liquid ozone. Exhaust velocities of 4000-5500 metres per sec. were possible with these fuels, but liquid ozone, although having some advantages over other oxidisers, was unstable and explosive.

Solid fuels gave lower exhaust speeds, and for certain purposes were less suitable than liquid fuels. Liquid fuels were more controllable—for example by adjusting the rate of mixing—than were solid fuels which burned at a rate which was a function of the material and of the physical form. However, liquid fuels had set problems of high speed pumping which had been solved.

As materials of construction, substances which were light, strong, heat resistant (high m.p.) were needed, and special steels were used. Graphite was good from all points of view except strength. Graphite control vanes were used in the German long-range rocket A-4 (also known as V-2), in which they were sited in the actual hot exhaust.

The fuel in the A-4 was alcohol and liquid oxygen. The fuel pumps were driven by steam turbines for which the steam was raised by the action of 85 per cent hydrogen peroxide on sodium permanganate. The chemical problems of production of 85 per cent peroxide, including concentration of the then usual 30 per cent material, storage and handling problems were tricky, but were overcome; for example, glazed earthenware or aluminium were employed.

The Germans also discovered the need to avoid contamination of the concentrate with even small amounts of Fe, Cu and other ions which cause decomposition, Various stablisers, such as phosphates, 8-hydroxyquinoline, etc., were used. Finally, a product was obtained that only lost 1 per cent strength in one year at ordinary European temperatures.

Dr. Griffiths mentioned, as a matter of interest, the amount of sodium permanganate used in the A-4 was 29 lb., the amount of liquid fuels was about 9 tons, including 5 tons of liquid oxygen, the fuel pump could operate at 680 h.p. for 110 sec., the range was about 200 miles, and the speed of the order of 3000 m.p.h. The maximum height was about 50 miles.

Reference was made to self-firing fuels —a mixture of methanol and hydrazine oxidised with 85 per cent hydrogen peroxide, for example—and to the possibility of interplanetary travel by rockets which shed their used fuel tanks.

Quantity Production of Hydrazine Hydrate

IN a note announcing that a member of the group has just completed a plant to make hydrazine hydrate, British Chemicals & Biologicals, Ltd., supplies an interesting commentary on the fresh scope which this foreshadows. Recalling that, since its isolation in 1887, hydrazine hydrate has remained a chemical curiosity, the note observes that it is now a commercial chemical with great possibilities. Probably the most useful property of hydrazine is its powerful reducing action, liberating nitrogen and water only as end products of the oxidation.

Hydrazine may be used in the manufacture of various organic chemicals and dyestuffs, in the preparation of a blowing agent for the plastics and rubber industries and for the production of fibre-forming polymers. It has many other applications—in metal deposition and refining and preventing oxidation.

In Germany, hydrazine was used in conjuction with hydrogen peroxide and other oxidising agents as a propellent fuel for "V" weapons and torpedoes.

It is indicated that the new supply is now available in tonnage quantities, of 60 per cent concentration. Hydrazine sulphate, hydrobromide, hydrochloride and nitrate are also being manufactured, and 90 per cent and 100 per cent hydrazine hydrate are available in research quantities.

PRODUCTION OF SISAL WAX

New British Process Described

FULLER information has now been provided in the new British patent literature on the original proposals for the recovery of wax from sisal leaves pioneered by the A.S.P. Chemical Company, of Gerrards Cross (THE CHEMICAL AGE, *60*, 7). The methods are summarised in patents numbered 630,270 and 630,271 which have been assigned to the company. The application date for both is January 15, 1947.

Solvent Extraction

The first of these claims an improved process for the extraction and purification of sisal wax. The sisal flesh is first contacted with an organic solvent, such as a mixture of benzene and ethyl alcohol, or trichlorethylene, at a temperature approximately the boiling point of the solvent, to extract the wax and other substances. The resulting products are treated with an absorbent, comminuted or not, to eliminate impurities. The solvent is then distilled off. The solvent reflux principle may be used with continuous distillation and leaching of the sisal mass with fresh solvent.

After addition of absorbent to the hot wax solution, the whole mixture is subjected to hot filtration and the purified wax filtrate recovered. This is then distilled. The absorbent may be charcoal, activated carbon, alumina, bone meal, etc. It may be used in various ways; in one example, the solution is passed through a heated column containing alumina.

Solid Deposits

The second patent No. 630,271, is broader in its title and comprises the recovery of wax from plant leaves or flesh generally, especially of sisal, hannequin, flax, jute and others. Its subject matter, however, is concerned with sisal only, and is very similar to the other.

The proportion of solvent to material treated may in some cases be 5: 1. The main steps consist, as before, in contacting the leaves or flesh with an organic solvent at the boiling point, or just below it, of the solvent. The solvent is distilled off, or the solution cooled to deposit extracts. The residue left after distillation or the deposit resulting from cooling is re-dissolved in the same or similar solvent. The solution may be mixed with absorbent before filtering. Both the process and product are protected by the patent.

PETROLEUM CHEMICALS

British Celanese Contribution

IN his report to the shareholders at the recent 30th annual general meeting of British Celanese Ltd., Mr. G. H. Whigham (chairman) referred to the heightened interest shown during the year in the establishing in this country of chemical industries based upon petroleum. He recalled their own oil-cracking installation, which was primarily erected for the provision of some of the basic materials required for their main products, had now been operating for a number of years and their research staff had made a number of contributions to the rapidly accumulating knowledge of this technique.

In the U.S.A. the requirements of the cellulose acetate industry in acetone and acetic acid had hitherto employed the largest proportion of organic chemicals made from petroleum. At the same time, the wider potentialities of this rapidly developing source of raw materials were being actively explored by British Celanese. Its scientific staff realised the importance of keeping abreast of world discovery in their long-term research. In the textile section, steady progress had been made in the improvement of existing processes, both by the adoption of modified techniques and the installation of new machinery, some of which they designed and constructed themselves.

The company's interest in plastics had continued, mainly in cellulose derivatives, and during the year several new uses and methods of application had been developed. The extension of cellulose acetate and chemical plant at Spondon embodied in the company's general expansion scheme was nearing completion.

Castor Oil for Paint Making

PROGRESS in the process to substitute castor oil for linseed oil in paint and varnishes manufacture is reported in *Indian Trade and Industry* (*1*, 308). The work has been carried out at the Central Research Laboratories, Hyderabad city. Using dehydrated castor oil and local earth as a catalyst, oil with improved drying properties is claimed to have been produced.

Paints and varnishes thus made have greater retention of colour and higher resistance to water, states a research worker of the institute. The discovery is of great significance to Hyderabad, which accounts for about 85 per cent of India's production of castor oil seeds.

CHEMICAL MARKETS IN AUSTRALIA

Degree of Dependence on Outside Sources

DESPITE a rapid growth of the chemical industry during the war, imports of chemicals play an important part in the economy of Australia.

Fertilisers are one of the major items, although local plants supply a proportion of the demand for superphosphates and sulphate of ammonia. Imports of fertilisers in 1948-49 were valued at £A2.5 million, the main sources of supply being Canada and the United Kingdom.

Other important items in the chemical group include textile and other dyes which, although now being locally produced in increasing quantities, are not yet sufficient to meet all requirements; industrial chemicals used in the manufacture of steel, glass, and plastics for which there is a steadily increasing demand; essential oils, insecticides, drugs, medicinal and toilet preparations.

Since 1940 there has been a considerable increase in the domestic output of pharmaceutical products such as caffeine, insulin, penicillin and the sulpha drugs, but imports still remain high and the U.S.A. the principal supplier.

Imports of rubber during 1948-49 were worth over £A6 million; two-thirds consisted of crude, waste and masticated rubber, and the remainder of finished manufactures, including elastic, rubber thread and pneumatic tyres. Tariff protection made possible the development in Australia of the manufacture of tyres, belting, hose and footwear.

Mineral Oils

Australia is almost entirely dependent on imported petroleum. Peace-time consumption of mineral oils averaged 600 million gallons a year but rose as the war-effort intensified to a peak of 860 million gallons during 1943-44. In 1948-49, imports of petroleum, kerosene, lubricating, residual and solar oils, which were valued at £A37,340,000 (nearly four times the 1938-39 figure), represented a heavy drain on Australia's financial resources.

Further efforts to recover oil on a commercial basis either within the Commonwealth or the adjacent islands of New Guinea, Papua, and Timor are likely to be made. Australian refineries concentrate on the processing of by-products, as all motor and aviation oil is imported in a refined state.

Crude aluminium is not at present produced in the Commonwealth, but its use has expanded greatly in the country in recent years. In contrast to pre-war, she now has a rolling-mill industry,

Imports, to-day, mainly in the form of ingots and blocks, as opposed to the plate and sheet of pre-war years, were valued at £A1,324,000 in 1948-49 in comparison with an annual average of £A203,000 between 1935 and 1939. The ingots and blocks, imported from Canada, are rolled in the new Sydney and Wangaratta mills.

Tasmanian Production

From being an importer of aluminium, Australia plans to become an exporter on the completion of the Government-sponsored Aluminium Production Commission's project to install plant with an ingot capacity of 10,000 tons a year, utilising local deposits of low-grade bauxite and alunite and hydro-electric power resources. Production is expected to commence in Tasmania in 1950. Potential home demand for aluminium, which did not exceed 1000 tons a year before the war, is not likely to absorb the maximum output of this plant, even if there is a large-scale replacement by aluminium of materials at present used in Australian manufacture.

Australian Wool Chemistry

A FURTHER step in the Australian Commonwealth Government's long-term research programme on wool textiles was taken recently when the minister in charge of the Australian Scientific and Industrial Research Organisation, Mr. J. J. Dadman, announced that two additional textile research laboratories were to be set up, one in Sydney, the other in Melbourne.

The proposed Melbourne laboratory will house the biochemistry unit, which will study the chemical structure of wool. The Sydney laboratory will contain the physics and engineering unit, which will undertake research on wool fibres and the engineering problems involved in processing. The existing Geelong organisation is concentrating on research into established processes and the development of new processes based on the results achieved by the whole group of laboratories.

HOME

Telephone Calls to Turkey

A telephone service has been opened with Turkey. The minimum charge for three minutes is 35s.

Industrial Disputes

It has been officially stated that the number of man-days lost by strikes during the first ten months of 1949 was about 790,000 working days in nationalised industries and 875,000 in other industries.

Liverpool Agency for Export Credits

The Export Credits Guarantee Department has opened a new office at 14 Castle Street, Liverpool 2, under the managership of Mr. E. J. Jackson. The telephone number of the new office is Liverpool CENtral 5756-7.

Prices of Oils and Fats

It is officially announced that no change will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four-week period ending December 31.

Rubber Group Award

The programme for yesterday's (Friday) dinner following the 28th annual general meeting of the Institution of the Rubber Industry included the presentation by the newly-elected president, Mr. Herbert Rogers, of the Colwyn medal for 1949 to Mr. E. A. Murphy, manager of the general development division of the Dunlop Rubber Co., Ltd.

National Titanium Pigments

A news item in this page last week (*61*, 783) incorrectly stated that National Titanium Pigments, Ltd., was to build a large factory at Kingsway, Luton, Bedfordshire. National Titanium Pigments, Ltd., whose headquarters are at Kingsway, Luton, states that no factory for the company is being built there. The company intends to start building a new plant in North Lincolnshire next spring.

New Power Plant

A steam-generated electric power station is to be constructed at Capenhurst which will make the Wirral and Dees-side area one of the greatest power producing centres in the country. The plant, which will supply power for the atomic energy development scheme, will be of the size and calibre of that being erected at Bromborough, for £9 million, and is expected to be completed and in operation by 1953.

Aid for Cancer Campaign

The British Empire Cancer Campaign will benefit from Liverpool University Chemical Society's annual concert given on November 24 and 25 at the University Students' Union.

Anthracite for Dollars

Export of anthracite to the U.S.A. from Britain, which ceased during the war, has begun again. A cargo of 3500 tons of South Wales anthracite has recently been sold for shipment to Boston, and two further cargoes are being negotiated.

Soap Import Regulations Relaxed

Imports under block licensing arrangements of certain types of soap will be permitted as from January 1, 1950, states the Ministry of Food. This will benefit exporting countries other than those excluded from the scope of the Board of Trade's notice No. 336, dated September 29.

Coal Output

Production of deep-mined coal in Britain last week reflected the customary pre-Christmas wages drive; it was the highest this year. Comparative figures are:—Last week: Total output 4,572,100 tons (deep-mined 4,355,000 tons, opencast 217,100 tons); week ended December 4, 1948: 4,341,700 tons (deep-mined 4,147,600 tons, opencast 194,100 tons).

Analysing a Meteorite

Prof. F. A. Paneth, professor of chemistry at Durham University, has signified his intention, with the help of three other scientists, to take measurements of the helium, uranium and thorium content of the meteorite which recently fell through the roof of an hotel at Beddgelert (Caernarvonshire) The study will add to the small amount of data now available for calculating the age of such objects.

Wool Grease Recovery

By arrangement with Mr. Maurice Webb, M.P. for Bradford Central, a film on wool grease recovery was shown under the auspices of the Parliamentary and Scientific Committee on November 29 in the Grand Committee Room, Westminster Hall, Palace of Westminster. The film is a pictorial record of the experiments of Bradford Corporation in the recovery of wool grease from the sewage of the city and the production from it of a series of important chemical by-products.

Technical Publications

QUESTIONS covering the supply of and demand for qualified people in the chemical industry are discussed in a report published this week by the Stationery Office. This is one of 12 reports on employment in the science and engineering professions, prepared for the Ministry of Labour and National Service by a number of panels appointed by the Technical Committee and presided over by Lord Hankey, of which five are now released. Other reports to be published later will refer to chemical engineering, metallurgy, and biology.

* * *

RESEARCH work carried out in the Shell laboratories on a variety of products suitable for replacing pine tar in rubber compounding resulted in the development of Dutrex R, a non-volatile petroleum derivative which is fully described in a booklet issued by Shell Chemicals, Ltd., London. It is claimed to be an efficient plasticiser and softener in natural rubber and to improve processing and add to the physical properties of the vulcanisate.

* * *

THE function of iodine as an essential part of nutrition of man and animals is discussed in some detail in "Iodine Facts" (Nos. 381-429) published by the Iodine Educational Bureau. It gives a comprehensive survey of goitre in animals and various preventive measures.

* * *

MEANS of quickening the rate of output while saving in man-power are discussed and illustrated in "Mechanical Handling To-day," a new booklet by The Chloride Electrical Storage Co., Ltd. Many examples are quoted to prove the advantages of battery-operated electric trucks in works and factories.

* * *

INVESTIGATIONS carried out on sinter alumina and the main factors affecting its usefulness, with particular attention to the chemistry of reaction in the solid phase and the orientation, growth, and general characteristics of the crystallites, are described by Dr. Felix Singer in "Sinter Alumina as Engineering Material for Cutting Tools and Turbine Blades." The author also draws attention to the increasing applications of sinter alumina components. The article, which is now issued in booklet form, is reprinted from *Ceramics* (Vol. *1*, Nos. 5 and 6, 1949).

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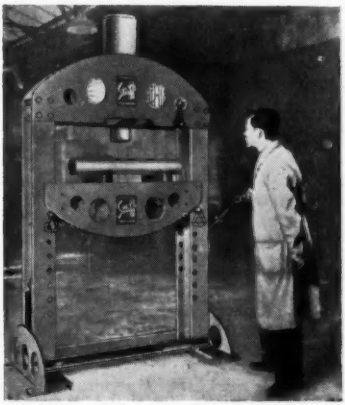

[Courtesy, Chamberlain Industries, Ltd.

Useful for many kinds of assembly work, this new Staffa 50-ton hydraulic Arbor press is also suitable for pressing, straightening, riveting, bending and clamping. The machine, designed by Chamberlain Industries, Ltd., Leyton, London, E.10, includes an automatic pressure release on the control valve to prevent overload

VARIOUS British Standards covering aluminium and aluminium alloy ingots and castings have now been combined into a single schedule recently published as B.S. 1490 : 1949—Aluminium and aluminium alloy ingots and castings for general engineering purposes.

The new schedule also includes specifications for ingots and castings not previously covered by British Standards.

The system of nomenclature, adopted accords with that in the recently issued B.S. 1470 for wrought aluminium and aluminium alloys sheet, strips, etc. The standard is concerned with aluminium of 99 per cent purity and 20 different alloys, each in the form of ingots and castings.

Details are also given regarding certification of compliance with the standard, independent tests, the provision of test samples and inspection procedure.

A few copies of this standard distributed before October 3, 1949, contain a printers' error in referring to alloy LM-6-M. Those copies should be returned. The new publication is 7s. 6d., post paid.

BAC PRESIDENT

Dr. Levinstein to Serve Again

DR. H. LEVINSTEIN was elected president for a second term of office at the 32nd annual general meeting of the British Association of Chemists, held in London last Saturday. Tribute to the doctor's keen interest in the association was paid by Mr. Norman Sheldon, who has served as president for the last three years.

An important offer by an insurance company to members was referred to in the council's report for 1948/49. Special facilities were offered at low premium, and the holder of the policy, if transferred for any reason, could take it to his new firm, which in effect rendered it a transferable pension scheme.

There had been an increase in membership during the year, the total now being 2218.

The good work of the general secretary, Mr. C. B. Woodley, who will shortly have completed 25 years' service, was particularly referred to and it was agreed that a presentation should be made shortly as a mark of the association's esteem and appreciation.

The Hinchley Medal was presented to Miss Winifred Wright, who has been an active worker on behalf of the association since its inception. She has served on many committees, and is one of the founders of the unemployment scheme.

Royal Society Officers

AT the 287th anniversay meeting of the Royal Society, held in London on November 30, the following were elected as officers and council for the ensuing year:—President: SIR ROBERT ROBINSON, O.M. Treasurer: SIR THOMAS MERTON; Secretaries: SIR EDWARD SALISBURY, SIR DAVID BRUNT; Foreign Secretary: PROF. E. D. ADRIAN, O.M. Other members of Council: BRIGADIER R. A. BAGNOLD, PROFS. G. L. BROWN, H. DAVENPORT, and F. G. GREGORY, SIR CYRIL HINSHELWOOD, PROFS. R. P. LINSTEAD, G. F. MARRIAN, H. S. W. MASSEY and F. E. SIMON, SIR WILLIAM STANIER, SIR GEORGE THOMSON, DR. H. G. THORNTON, PROF. C. E. TILLEY, DR. F. M. R. WALSHE, DR. V. B. WIGGLESWORTH, PROF. S. ZUCKERMAN.

DR. S. DEVONS has been appointed to the recently instituted London University chair of physics at the Imperial College of Science and Technology.

PETROLEUM IGNITED

Cause of I.C.I. Fatality

THE unauthorised use of an electric stove in a storeroom at the Winnington works of I.C.I., Ltd., was stated at the inquest at Northwich on November 30 to have been the cause of the death of George Mills, aged 54, of Weaver Park, Northwich, who died from shock following extensive burns received while at work. A verdict of Misadventure was returned. It was stated that Mills was in a storeroom in the electrical department when a tray containing petrol fell from a shelf and became ignited by the electric stove. Mills ran out of the room enveloped in flames. John Henry Lewis, of Waterloo Road, Northwich, assistant technical officer with I.C.I., said it was against the regulations for an open stove of any kind to be used in a room where petrol was stored. The coroner (Mr. R. A. Daniel), said the evidence showed that when petrol was returned to the storeroom it was the practice for Mr. Mills to put it in a container. On this occasion he failed to do so.

Disputed Cause of Pollution

THE difficulty of distinguishing with certainty the source of pollution of a waterway was illustrated during the hearing at Pwllheli on November 30 of summonses relating to the alleged release by Southern Caernarvonshire Creameries, Ltd., of milk effluent into the River Erch. Fish were killed and, according to the Chester public analyst, two samples of water contained 0.1 per cent dissolved oxygen, and none. The Liverpool city analyst and a bacteriological analyst disagreed with the Chester analyst's conclusions and attributed the pollution to a neighbouring sewerage outfall.—The defendant company was fined £15 and ordered to pay £17 7s. costs.

Borax and Boric Acid Prices

BORAX Consolidated, Ltd., and Borax Chemicals, Ltd., advise the following reduced prices, to apply on and after December 1:—Granular borax technical (commercial) quality £35 10s.; granular boric acid technical (commercial) quality £63; anhydrous borax £55, net per ton delivered buyers' address in Great Britain in 1-ton lots and upwards, with the usual surcharges for smaller quantities. Prices for technical crystal and powder and B.P. quality are unchanged.

PERSONAL

SIR GRAHAM CUNNINGHAM, chairman and managing director of Quickfit & Quartz, Ltd., has resigned his voluntary post as chairman of the Dollar Exports Board. In a statement last week, Sir Graham said that he had resigned on November 9, but would make no comment on his reasons, which he had given to the board. He would, however, continue to give its members all the help he could. SIR CECIL WEIR, former British Economic Advisor in Germany, has been appointed in his stead.

The Mond Nickel Fellowships Committee has made awards for 1949 to MR. J. MONAGHAN (Stewarts & Lloyds, Ltd.) to study the method of control and administration of basic open-hearth operation and practice in the steel industry in the U.S.A., and to MR. R. STEWARTSON (United Steel Companies, Ltd.) to study the design and operation of modern hot rolling mill plant in the U.S.A.

MR. EDGAR W. HOLMES has been presented with a gold wristlet watch in appreciation of his 30 years' service as works chemist with John W. Leitch & Co., Ltd., Milnsbridge Chemical Works, Huddersfield. Dr. A. E. Everest, managing director, made the presentation.

SIR EDWARD APPLETON, SIR LAWRENCE BRAGG and PROF. ANDREW ROBERTSON will be the speakers on the place of technological education in university studies at the 1949 Conference of the Universities of Great Britain and Northern Ireland on Friday and Saturday (Dec. 16 and 17).

COLONEL L. C. HILL has been elected president of the Institution of Mining and Metallurgy for the session 1950-51, and will take office on May 18, at the annual general meeting. Col. Hill has long been associated with the Spanish Rio Tinto Company.

MR. J. W. COLE was re-elected president at the annual general meeting of the Paint Research Association held in London last week.

MR. WILLIAM H. HOOVER, a 60-year-old Butte, Montana, lawyer, has been elected president of the Anaconda Copper Mining Company, one of the world's largest copper producers. Mr. Hoover succeeds the late Mr. James R. Robbins, who died on November 14 while on a business trip to Butte.

Mr. L. W. Blundell

MR. S. ROBERTS, products salesman of the North Thames Gas Board, retired on December 31, after more than 50 years' service. MR. L. W. BLUNDELL, superintendent of the Board's products works, has been appointed controller of by-products as from January 1, and will become responsible for the manufacture and sale of all the Board's chemical by-products. Mr. Blundell achieved early distinction in chemical engineering at the Imperial College of Science, which was recognised by the conferment of the D.I.C. and the M.Sc., and later as a research chemist in the iron and steel industry he received the Junior Moulton Medal of the Institution of Chemical Engineers. He joined the Gas Light & Coke Company as a chemical engineer in the tar and ammonium products works in 1929.

SIR W. ARBUTHNOT LANE, managing director of Kaylene, Ltd., has been appointed by the Home Office to be Commandant-in-Chief of the Metropolitan Special Constabulary. He joined the force in 1926 as a constable.

Obituary

MR. BERNARD R. ARMOUR, president of the American Aniline Products, Inc., and the Heyden Chemical Corporation, and director or executive of many other companies, died in New York on December 1, at the age of 58.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

A $60 million refinery, to be known as the Eagle Point Works, with a rated capacity of 40,000 barrels of crude oil daily, has been placed in operation at Westville, New Jersey, by the Texas Company, representing Texaco's first installation of refining facilities on the East Coast. The new refinery will handle principally crudes from Arabia and Venezuela and is stated to be capable of yielding 55 per cent gasoline, 20 per cent heavy fuel oil, and 25 per cent distillates. Eagle Point will represent the first commercial application of Texaco's process for using furfural to eliminate sulphur in crude oil in the production of such petroleum products as heating oils. Furfural has hitherto been used principally in the refining of motor oils.

* * *

Mr. John R. Steelman, President Truman's White House assistant, reports that the U.S. Government is sponsoring a vastly increased programme of scientific research. "Only 20 years ago," he says, "the total private and Governmental expenditures for research were about $166 million. By 1940 the the amount spent was $345 million, and today the Federal expenditures alone are nearly $1400 million." Mr. Steelman said that the nation must offer every incentive to science and experimentation, and called for the establishment of a national science foundation.

* * *

The Otto H. York Company, Inc., East Orange, New Jersey, has been granted merchandising and manufacturing rights in the U.S.A. for the mechanical seals of Flexibox, Ltd., Manchester, England. These seals, originally designed to overcome problems encountered during the operation of oil refinery process pumps, have proved so effective, that a demand was created for their adaptation to other industrial processes.

* * *

Mr. M. Novomeysky, managing director of Palestine Potash, Ltd., is at present in New York on a mission to raise $8-$9 million from British and American companies to aid in the development of potash deposits around the Dead Sea. The company hopes to get most of the capital from the U.S.A. as investment by private companies. The Dead Sea is said to contain, in addition to potash, large quantities of magnesium chloride.

* * *

A new acrylic fibre said to be resistant to sunlight effects is the latest addition to the range of synthetic textile filaments. The fibre has been produced in the research department of the Chemstrand Corporation which was recently formed by the Monsanto Chemical Co., and the American Viscose Corporation, and it is expected that it will be available for commercial testing in the next few months.

* * *

Described as "a significant contribution to radiological defence," the development is announced by United States Army officials of a new, compact, lightweight, radiation-detecting device, called a "radiac set," primarily for use by military and civil defence organisations. The new device, first of its kind developed for heavy field use, employs an ionisation chamber and makes use of results of atomic bomb tests in the Pacific. Less sensitive than the Geiger counter, the radiac set is intended for detection and measurement of relatively large concentrations of radiation beyond the normal capabilities of the Geigy counter. It is 10½-in. long and weighs 10 lb.

* * *

A new patent covering cobalt solution purification has been made available for non-exclusive and royalty-free licensing by the U.S. Department of the Interior, Washington, D.C. Impure cobalt solution, in which zinc is present, is treated with an excess of hydrogen sulphide under an elevated pressure of at least 10 p.s.i., and at a solution *p*H between 1 and 6. Zinc is precipitated as a sulphide, and the purified cobalt solution drained off.

Agents for Lithium Minerals

"Alreco" (The Almex Recovery and Refining Co., Ltd.), Adelphi Terrace House, Robert Street, London, W.C.2, has been appointed sole sales representative for Europe and the British Commonwealth of the Black Hills Keystone Corporation of South Dakota, U.S.A., producers of lithium-bearing minerals, such as amblygonite and spodumene.

OVERSEAS

Spitsbergen's Record Coal Shipments

Shipments of coal from Spitsbergen by the Spitsbergen Coal Company were 403,000 tons this year, the largest ever recorded. Last year's total was 350,000 tons.

New Temperature-Resistant Steel

The Lebanon steel foundry in Pennsylvania on November 28 announced that it had developed a super-alloy cast steel which would stand great extremes of heat or temperatures as low as 423°F. below zero. This "Lebanon-22" contains, among other constituents, 19.50 per cent chromium and 9 per cent nickel. The firm says the alloy has already been used effectively in the production of steel castings for storage of liquid oxygen.

Rubber Consumption and Stocks

World consumption of natural rubber for the first nine months of 1949 was 1.19 million tons, including Russian imports estimated at 97,500 tons, states the Rubber Study Group. Aggregate production for the same period was 1.2 million tons. The rise in the world consumption was continued in October, when the 127,500 tons was 12,500 tons above the September figure. Stocks of natural rubber at October 30 amounted to 725,000 tons, showing a decline of 45,000 tons since January 10. Synthetic rubber stocks were 120,000 tons, a fall of 5000 tons since January 1.

Cobalt Smelting in Canada

The Cobalt Chemical and Refinery Company, Ltd., as part of its expansion programme, has put into operation its new cobalt smelter at Cobalt, Ontario(THE CHEMICAL AGE, *61*, 394). The smelter will be concerned chiefly with the production of chemical derivatives of cobalt. When completed, the plant will have cost about $1.25 million. Full-scale operations should begin in March. Electro-furnaces have made the first run of bullion and speiss produced from local ores. A wide range of industrial and agricultural chemical derivatives will eventually be produced. Cobalt has recently assumed great importance because of its heat-resistant qualities which make it indispensable for use in rockets, jet propulsion power plants and similar exacting rôles. The new supply may replace some imported materials.

Duty-Free Books and Films

A draft of an international agreement to facilitate the circulation of educational matter of many types has been sent by Unesco to all the member states of UNO. The agreement was drafted by the conference at Annecy, France, in which 34 nations took part, and seeks duty-free entry for educational material.

U.S. Firm Regains German Plants

The American Radiator and Standard Sanitary Corporation, New York, has repossessed the Neuss plant properties of its German subsidiary, Nationale Radiator Gesellschaft GmbH. The plants are a pottery, an enamelled iron plant and a radiator plant, all located in Neuss in the Western zone of Germany. They had been under the custodianship of the Allied Military Government.

British Science Lectures in U.S.A.

"The Growing Importance of Infra-Red Studies in Physics, Chemistry and Biology," will be the subject of the British-American Association lecture to be given by PROF. G. B. B. M. SUTHERLAND at the meeting of the American Association for the Advancement of Science to be held in New York from December 26-31. The professor, formerly of Cambridge, is now professor of physics in the University of Michigan. A talk on the organisation of science in Britain will be given by DR. W. A. MACFARLANE, of the United Kingdom Scientific Mission in Washington.

Steel for Canada

British steel firms are expecting orders worth between $15 and $20 million from Canada during the next 12 months. Their representatives have been concentrating on the sale of particular products, while a team led by Sir George Binney has made a coast-to-coast survey of the Canadian market during the past seven weeks. Mr. Edward Senior, commercial director of the British Iron and Steel Federation, joined the mission in the final stages of the negotiations.

About half the tonnage has already been definitely booked, including a valuable rail order for British Columbia. Steel plates, bars and tubes are the other principal products to be exported, but orders for a wide range of British steels were secured.

Next Week's Events

MONDAY, DECEMBER 12

The Chemical Society

Aberdeen: Marischal College, 7.30 p.m. (With RIC and SCI). Prof. H. J. Emeléus: "Some Recent Advances in the Chemistry of Fluorine Compounds."

Institution of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. C. E. Webb: "Sulphur Chloride Reactions in Relation to the Rubber Industry."

Institute of Metals

Glasgow: 39 Elmbank Crescent, 6.30 p.m. Discussion: "The Casting of Non-Ferrous Metals."

Society of Chemical Industry

Leeds: University, 7 p.m. W. R. Atkin: "The Durability of Leather."

TUESDAY, DECEMBER 13

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Dr. A. G. Evans (University of Manchester): "Polymerisation by Friedel-Crafts Catalysts."

The Royal Institute of Chemistry

Mitcham Junction: Philips Electrical, Ltd., New Road, 6.45 p.m. H. A. Klasens: "Chemistry of Bioluminescence and its Importance in Animal Behaviour."

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1, 5.30 p.m. Dr. J. M. Coulson: "Fluid Flow through Granular Beds."

Institute of Physics

London: 47 Belgrave Square, W.1, 5.30 p.m. (Electronics Group). Dr. W. Grey Walter: "The Nervous System as an Electrical Machine."

Society for Visiting Scientists

London: 5 Old Burlington Street, W.1, 7.30 p.m. Discussion: "The Scientific Approach to Human Problems in Industry." Chairman: General Sir Ronald Adam. Speakers: Sir George Schuster, and W. B. D. Brown.

Society of Instrument Technology

Manchester: Reynolds Hall, College of Technology, 7.30 p.m. Dr. G. Jessop: "Gas Analysis by Katharometer."

WEDNESDAY, DECEMBER 14

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.15 p.m. (Food Group, Nutrition Panel). "The Nation's Manufactured Foods," third meeting of series.

Scottish Engineering Students' Association

Glasgow: 39 Elmbank Crescent, 7.30 p.m. J. C. Murray: "Marine and Industrial Gas Turbines."

Irish Chemical Association

Dublin: Trinity College, 7.45 p.m. T. F. O'Reilly: "Some Aspects of Water Chlorination."

British Association of Chemists

London: Falstaff Restaurant, Eastcheap, 7 p.m. Smoking concert. Running buffet.

THURSDAY, DECEMBER 15

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.15 p.m. D. Ll. Hammick and S. F. Mason: "Some Physico-chemical Properties of Acridine Antimalarials with reference to their Biological Action"; C. C. Addison and S. K. Hutchinson: "The Properties of Freshly Formed Surfaces." Parts II-14.

Liverpool: University, 4.30 p.m. Dr. W. Charles Evans: "The Biological Oxidation of certain Aromatic Compounds with special reference to the Bacterial Cleavage of the Benzene Ring."

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. The Wilkins lecture. Prof. E. N. da C. Andrade: "Robert Hooke."

Oil and Colour Chemists' Association

Glasgow: St. Enoch Hotel, 7 p.m. R. Wilson: "Improved Film-forming Materials from Dehydrated Castor Oil."

Institute of Metals

Sheffield: Grand Hotel, 6.30 p.m. E. Davis: "Recent Progress in Copper and Copper Alloys."

FRIDAY, DECEMBER 16

Oil and Colour Chemists' Association

Birmingham: Chamber of Commerce, New Street, 6.30 p.m. A. W. Wolstenholme: "Silicone Resins in Paint Manufacture."

Institution of Electronics

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. F. F. Heyman: "The Betatron."

Atomic Scientists' Association

London: University College, Gower Place, W.C.1, 6 p.m. Prof. J. S. Mitchell (Cambridge): "Medical Advances in Nuclear Physics."

Electrodepositors' Technical Society

Sheffield: Grand Hotel. A. E. Nicol: "The Mechanism of Electrolysis."

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

EAST ANGLIA CHEMICAL CO., LTD., Darlington. (M., 10/12/49.) November 9, debenture, to Martins Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *£21,400. December 31, 1948.

ELECTRONIC DEVELOPMENTS (SURREY), LTD., Surbiton. (M., 10/12/49.) November 4, £2500 debenture, to Branch Nominees, Ltd.; general charge. *£2500. October 5, 1949.

LAUTARO NITRATE CO., LTD., London, E.C. (M., 1012/49.) October 27, two mortgages, each supplemental to a trust deed dated October 22, 1925, deeds dated December 15, 1936, supplemental thereto, indenture securing series of bonds dated July 1, 1929, and deeds supplemental thereto; both charged on certain areas of land in Chile. *£2,645,767. January 12, 1949.

NATIONAL FIRE PROTECTION CO., LTD., London, E.C. (M., 10/12/49.) November 10, £4600 mortgage, to Sterling Securities Investment Co., Ltd.; charged on Castlehurst, Station Road, Leatherhead, together with certain rights. *£66,638. January 5, 1949.

Increases of Capital

The following increases in capital have been announced, BROWNINGS & GOLDSBROUGH, LTD., from £5000 to £7000; ROBERT YOUNG & CO., LTD., from £50,000 to £100,000.

Change of Address

The head office (including the registration department) of the British Oxygen Co., Ltd., is now at Bridgewater House, Cleveland Row, St. James's, London, S.W.1. (Telephone No. WHItehall 9777).

Company News

Evans Medical Supplies

Stockholders of Evans Medical Supplies, Ltd., at special class and extraordinary general meetings of the company, in Liverpool on December 1, approved proposals covering several changes in the capital of the company, one of which will increase the authorised capital from £450,000 to £1 million (THE CHEMICAL AGE, *61*, 718).

Industrial and Commercial Finance Corporation, Ltd.

The statement by the chairman, Lord Piercy, to be presented at the fourth annual general meeting, on December 20, of Industrial and Commercial Finance Corporation, Ltd., indicates an operating profit for the twelve months to September 30 of £149,394. An analysis of industries which the corporation has been able to assist, with the total of business approved in each case, includes: cement and lime £260,000; chemicals £1,553,400; non-ferrous metals £281,000; rubber manufacture £170,000; plastics £362,000; scientific instruments £105,000.

Lawes Chemical Co., Ltd.

Dividends of 7 per cent on the non-cumulative participating preference shares and 6 per cent on the ordinary shares (both net) are announced. Referring to the Government decision to remove fertiliser subsidies in two stages (July 1, 1950, and July 1, 1951), the chairman foresaw that resulting increased prices might have an adverse effect on demand. It was hoped to complete erection of the company's sulphuric acid plant for operation in a year's time.

Richard Thomas and Baldwins, Ltd.

An interim dividend of 5 per cent, less tax, on the ordinary stock for the year ending April 1, 1950, payable on February 1, has again been declared by the directors. A similar interim payment was paid for each of the three previous years, followed by 10 per cent final dividends. A dividend of 3½ per cent in respect of participating rights on the preference stock, as a year ago, is also announced.

Watson, Laidlaw and Co.

A share issue of 110,000 shares at 12s. 6d. is being arranged by Glasgow Industrial Finance, Ltd., in the old established Glasgow concern of Watson, Laidlaw & Co., Ltd., centrifugal engineers and specialists in sugar, chemical, laundry and textile plant manufacturing.

The Stock and Chemical Markets

A DULL phase and irregular trends in stock markets are evident. British Funds eased because of doubts that the Government broker will still be prepared to support the gilt-edged market now that conversion terms for 1¾ per cent Exchequer bonds have been announced. The new 2¼ per cent Exchequer bonds are generally expected to command a price of at least par when dealings start. Industrial shares were inclined to ease, but generally the volume of business has been small.

Chemical and allied shares again moved closely with the general market trend. Imperial Chemical, for instance, touched 43s., but later eased to 42s. 6d. Dunlop Rubber were 61s. 6d. after being 62s., and Turner & Newall 75s. 6d. after 76s. 3d. Monsanto kept steady at 50s., Albright & Wilson were 30s., and Amber Chemical 2s. shares 4s. 7½d. Fisons changed hands around 28s., and there are reports that this company may raise further capital, possibly in the form of private placing of debentures. Brotherton 10s. shares have been around 19s. 3d., Laporte Chemicals 5s. ordinary units were 9s. 6d., and Glaxo Laboratories were good, changing hands at up to £22. Howards & Sons new 5½ per cent preference were about 22s. 9d.

British Xylonite came back to 60s. after touching 61s. 3d.; British Industrial Plastics 2s. shares were 4s. 10½d.; Kleemann 8s. and De La Rue better at 23s., although shares of plastics and allied companies generally were uncertain. The 4s. units of the Distillers Co. improved to 18s. United Molasses were 39s. 3d., but British Match firmed up to 32s., and British Oxygen, at 90s. 3d., and British Aluminium, at 41s. 6d., have been firm. Levers attracted attention up to 43s. 9d., and Lever N.V. improved to 44s. 3d. Elsewhere, General Refractories improved to 22s. 4½d. and Triplex Glass to 17s. 7½d. Firmness was maintained by Borax Consolidated at 57s. 9d., and British Glues were better at 18s. 6d. Amalgamated Metal at 18s. failed to hold an earlier gain.

Iron and steels moved narrowly, but have been generally quite well maintained. Babcock & Wilcox strengthened to 60s. 3d. and T. W. Ward showed firmness at 55s. 1½d. Staveley firmed up to 80s., although Wm. Cory came back to 79s. 6d. Powell Duffryn were better at 26s. 6d. Pinchin Johnson came back to 34s. 6d. for the big new issue which will bring in over £1 million for factories at home and the company's overseas subsidiaries.

Boots Drug were better at 49s. 9d., but Beechams deferred eased to 14s. 10½d. after an earlier rise. German Potash Bonds improved, the 7 per cent to 68½ and the 6½ per cent to 64½.

Market Reports

A STEADY trade characterises most sections of the industrial chemicals market and quotations remain unchanged although with a very firm undertone. A fair amount of contract renewal business has already been placed and inquiries for new business covering deliveries during the first half of 1950 are fairly numerous. The volume of inquiry for shipment shows no sign of falling off and export trade is facilitated by the better supply position. Both the potash and soda compounds continue at the recent level of prices, and similar conditions apply in other directions with the exception of borax and boric acid prices, which were reduced on December 1 to £35 10s. per ton and £63 10s. per ton respectively. As from December 1 the maximum prices for ground sulphur were increased to 33s. per ton, the increase being due to the change in the sterling-dollar exchange rate. In the coal tar products market there is a keen demand for pitch, both on home and export account. There is a very active demand for xylol and a steady interest is maintained for carbolic acid, cresylic acid and toluol.

MANCHESTER.—The usual seasonal slackening in new business is likely to be witnessed in the next week or two, although this is not yet in evidence. During the past week there has been a fair amount of new inquiry from home consumers as well as from shippers. Delivery instructions against contracts for caustic soda, potash, ammonia and magnesia chemicals have been circulating steadily. A fair demand is reported for most of the tar products, particularly the light distillates. Export business in basic slag and a few other sections of the fertiliser trade has been moderate.

GLASGOW.—Business in the Scottish chemical market has shown a decided improvement. Prices have tended to be firm, although no marked advances have been noted. Export market conditions generally have been quiet.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Heating of containers receiving material intended to be extruded under pressure.—Soc. Anon. des Ateliers et Chantiers de la Loire, and Compagnie Generale du Duralumin et du Cuivre. Jan. 5 1944. 630,468.

Anti-fouling paints and like compositions.—E. L. Holmes. Sept. 25 1947. 630,534.

Dielectric heating apparatus.—Westinghouse Electric International Co. Oct. 4 1946. 630,355.

Manufacture of organic pigments and moulding powders.—Calico Printers' Association, Ltd., L. A. Lanze, A. Schofield, and E. Spinner. Oct. 8 1947. 630,359.

Clamping means for apparatus for use in scientific demonstrations.—W. & J. George & Becker, and R. H. Morris. Oct. 23 1947. 630,409.

Treatment of clay.—English Clays Lovering Pochin & Co., Ltd., N. O. Clark, and T. W. Parker. Nov. 11 1947. 630,418.

Electronic treatment of liquids for the purpose of reducing the effects of hardness.—A. H. Brake, and S. C. Osborne. Nov. 12 1947. 630,419.

Flow meters.—R. P. Black. Nov. 26 1947. 630,473.

Rotary pumps for liquified gases.—Linde Air Products Co. Jan. 9 1947. 630,483.

Rotary pumps for liquified gases.—Linde Air Products Co. Jan. 9 1947. 630,542.

Process for the production of rubber-like copolymers.—J. C. Arnold. (Standard Oil Development Co.). May 29 1945. 630,362.

Production of fluorocarbons, and fluorohydro-carbons.—W. N. Haworth, F. Smith, and E. V. Appleton. June 23 1944. 630,606.

Process for the production of amino alkyl thiazole derivatives.—Ward Blenkinsop & Co., Ltd., A. A. Goldberg, and W. Kelly. July 11 1945. 630,671.

Method and device for combusting waste liquors with recovery of chemicals.—D. Dalin. June 20 1945. 630,857.

Hydrogenation of cyclic organic nitrogen compounds.—I.C.I., Ltd., J. G. M. Bremner, and F. Starkey. July 5 1946. 630,859.

Process for the preparation of nuclear substituted quinoline compounds and intermediates therefore.—H. R. Snyder, and R. E. Jones. June 4 1945. 630,860.

Manufacture of substituted ammonium thiocyanates.—Koppers Co., Inc. July 11 1945. 630,861.

Hydrogenation of cyclic organic compounds.—I.C.I., Ltd., J. G. M. Bremner, and F. Starkey. July 17 1946. 630,863.

Acylated esters of hydroxy-substituted 18 carbon atom aliphatic monocarboxylic acids and process of preparing same—B. F. Goodrich Co. Aug. 10 1945. 630,610.

Alkaline washing agents.—Soc. des Produits Peroxydes. Jan. 15 1942. 630,864.

Processes for producing hydrogenated tall oil acids and the product resulting therefrom.—A. H. Stevens. (Armour & Co.). Aug. 22 1946. 630,686.

Method of fusing materials such as glass.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauny & Cirey. Jan. 29 1945. 630,735.

Methods of polymerising unsaturated monomeric organic materials.—B. F. Goodrich Co. May 3 1944. 630,611.

Sensitised sheets for positive diazotype screen reflectography processes.—Chemische Fabriek L. Van Der Grinten. Nov. 1 1945. 630,874.

Synthetic resin compositions.—Continental Can Co., Inc. Oct. 11 1941. 630,700.

Silicone compositions.—British Thomson-Houston Co., Ltd. Nov. 30 1945. 630,883.

Absorption and separation of vapours and gases.—I.C.I., Ltd., W. Tyerman, and F. Wrigley. Dec. 4 1946. 630,884.

Manufacture of activated carbon.—T. Ness, Ltd., O. Reynard, and W. A. Walmsley. Dec. 5 1946. 630,886.

Process for the manufacture of fluoranthene derivatives.—Ciba, Ltd. Dec. 21 1945. 630,704.

Melamine resins.—British Industrial Plastics, Ltd. June 7 1946. 630,618.

Method of obtaining refined aluminium, starting from aluminium alloy scrap.—Compagnie de Produits Chimiques et Electro-Metallurgiques Alais, Froges & Camargue. Dec. 3 1945. 630,891.

Manufacture of siloxane resins.—Dow Corning Corporation. Jan. 21 1946. 630,892.

Apparatus for dispensing liquefied gases.—Linde Air Products Co. Jan. 23 1946. 630,893.

Apparatus for testing porous masses charged with acetylene.—J. S. Skelton, and C. M. Smith. Jan. 13 1947. 630,895.

Process for preparing 2-sulphanilamidopyrazine and the 2-sulphanilamidopyrazine resulting therefrom.—Mead, Johnson & Co. Feb. 5 1941. 630,898.

Production of aldol and/or crotonaldehyde.—Usines de Melle. Feb. 18 1946. 630,904.

Linear polythioesters.—Wingfoot Corporation. Nov. 2 1946. 630,625.

Production of nitric oxide.—Wisconsin Alumni Research Foundation. Aug. 16 1943. 630,175.

Liquid compositions.—British Thomson-Houston Co., Ltd. March 21 1946. 630,911.

Process of obtaining barium carbonate.—G. & W. H. Corson, Inc. April 30 1946. 630,720.

Hydrolysis of vinyl ethers.—General Aniline & Film Corporation. June 28 1946. 630,926.

Alkylene cyanohydrins and method of producing same.—American Cyanamid Co. June 4 1946. 630,929.

Polymerisable compositions and polymers thereof.—E. I. Du Pont de Nemours & Co. May 21 1946. 630,632.

Resolution of azeotropic mixtures of chlorosilanes.—British Thomson-Houston Co., Ltd. May 23 1946. 630,724.

Conjugation of fatty oils and acids.—Lever Bros. & Unilever, Ltd., and D. McNicoll. June 6 1947. 630,634.

Preparation of tetramethyl silicate.—British Thomson-Houston Co., Ltd. June 26 1946. 630,644.

Method of adhesively uniting materials, especially metals, and adhesives therefor.—Ciba, Ltd. July 19 1946. 630,647.

Manufacture of esters of cellulose.—British Celanese, Ltd. July 17 1946. 630,937.

Process for the manufacture of folic acid.—Roche Products, Ltd. (F. Hoffmann-La Roche & Co., A.G.). July 18 1947. 630,751.

Parasiticidal preparations. — United States Rubber Co. Oct. 14 1938. 630,752.

Ferrous alloy.—Coast Metals, Inc. Aug. 3 1940. 630,753.

Phenol-acetal reaction products.—Harvel Corporation. June 29 1943. 630,758.

Hydrocarbon synthesis process.—Standard Oil Development Co. Nov. 9 1946. 630,950.

Manufacture of organo-silicon esters.—J. G. Fife. (Dow Corning Corporation). Aug. 26 1947. 630,951.

Manufacture of organo-silicon alcohols.—J. G. Fife. (Dow Corning Corporation). Aug. 26 1947. 630,952.

Extrusion machines for materials in a plastic state.—C. L. Willis. Oct. 3 1947. 630,662.

Method of adhesively uniting materials and adhesive agents therefor.—Ciba, Ltd. Oct. 25 1946. 630,663.

Silvering of non metallic heat-resisting bases.—Johnson, Matthey & Co., Ltd., and F. E. Kerridge. Dec. 11 1947. 630,780.

Method of obtaining antimony from sulphurised antimony ores.—Soc. Minière et Metallurgique de Penarroya, and J. J. Listrat. Oct. 30 1946. 630,782.

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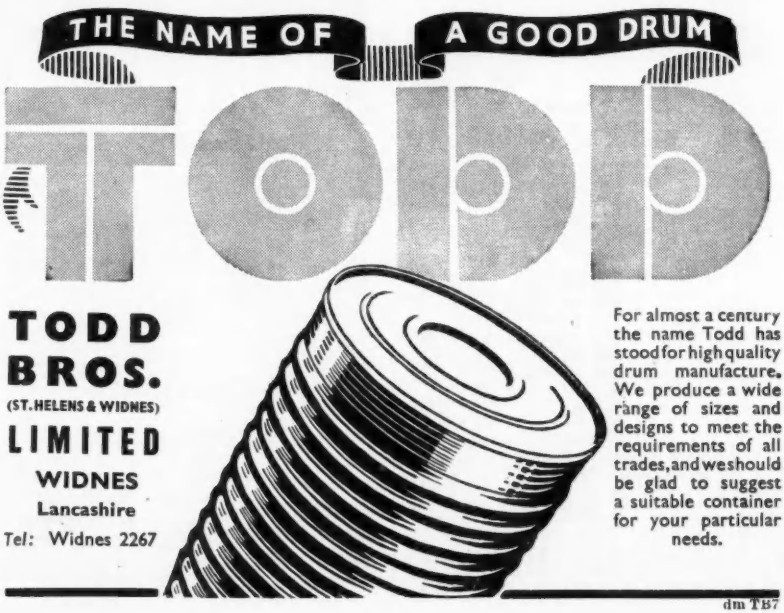

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